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MONTHLY JOURNAL DEVOTED TO THE DEVELOPMENT OF FISHERY INDUSTRIES

FISHING CHIMES

Upgrades Capabilities , Augments Output

- Tawa reservoir fish production at All Time High
- Mahseer fishery development : Recommendations
- Barcoding System : Application in seafood industry
- Trace minerals : Role in culture fish production

NOVEMBER 2001

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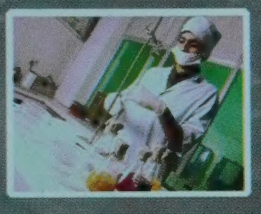

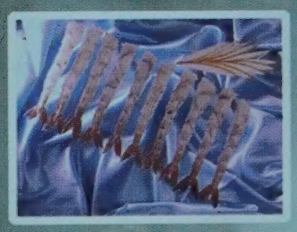

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A monthly journal devoted to the development of Fishery Industries

Upgrades Capabilities ; Augments Output

NATIONAL FISHERIES JOURNAL OF INDIA

Vol. 21 No. 8

NOVEMBER 2001

CONTENTS

Irradiation for Preservation of Perishable Food Items like Seafoods

Devadasan tells us in this contribution that irradiation can be considered as a good method for increasing shelf life and hygienisation of fish products. He observes that available evidence shows that it is an unnecessary fear to think that irradiation makes foods carcinogenic. He, however, warns that irradiation must be done under the most stringent control by highly trained staff. 7

National Workshop on Sustainable Participatory Development and People's Management of Natural Resources

Reservoir fishery development in Tawa Reservoir in M.P. by Tawa Matsya Sangh was an uniquely successful experiment. The dedicated development work done by the organisers in the past five years, involving tribal fishermen, led to an increase in fish production from 93 t in 1996 - 97 to 393 t by 1999 - 2000. In 2000 - 01, the production averaged at a level of 327.175 t. The income per ha rose from Rs. 7.06 lakhs in 1996 - 97 to Rs. 32.370 lakhs by 1999 - 2000 and in 2000 - 01 the income per ha reached a level of 26.94 lakhs. The average income of fishermen which was Rs. 6562 in 1996 - 97 went up to Rs. 24,469 by 1999 - 2000 and in 2000 - 01 the annual income per fishermen settled at a level of Rs. 22,708. At a National Workshop conducted on the subject at Kesla, Hoshangabad, on 1 and 2 November 2001, important recommendations were made of which one was that two tier cooperative structure adopted by Tawa Matsya Sangh should be considered as a model for reservoir fisheries development of all large reservoirs in the country. Considering all the good work done by it, Tawa Matsya Sangh deserves a renewal of the lease of fisheries of the reservoir in its favour..... 29

National Workshop on Mighty Mahseer

This Workshop was conducted at Lonavla, Maharashtra on 24 and 25 August 2001, under the auspices of Tata Power Company Limited, Central Institute of Fisheries Education, National Research Centre on Cold Water Fisheries, the Indian Fisheries Association and the Asian Fisheries Society. The Workshop reviewed the progress in the development of Mahseer fisheries of the country and recommended that a perspective plan on Mahseer fisheries for five years be developed. Among the other recommendations were: National Centre on Mahseer breeding and conservation be established at Lonavla; basic studies on embryology and reproductive physiology of Mahseer species may be taken up; Mahseer hatcheries be established by the state fisheries departments concerned in respect of their specific mahseer resources, for the purpose of stock enhancement; and trials on the sustainability of mahseer as aquatic species for aquaculture with emphasis on running water aquaculture, cage culture be carried out. Several other recommendations were also made. 31

Advances in Satellite Technology Vis-A-Vis Aquaculture

In this contribution, H.K. De and his associates provide a succinct picture of the role of satellite communication and remote sensing in aquaculture. An account of achievements of Indian Satellites has also been given... 7

Other Inclusions : Application of Bio-technology in Fish Processing and Product Development - 11; Religious Aquatic Sanctuary for *Rita rita* (Ham) in River Ganga - 22; Fish Farmers Meet, Sambalpur, Orissa - 24; Indian Seafood Industry: Emerging Banking Interventions - 31; Importance of Trace Minerals in Aquaculture Nutrition - 34; Training Programme on "Eco-friendly and Sustainable Freshwater Prawn Farming" - 37; Indo - UK Workshop on "Need Based Professional Education and HRD in Fisheries" - 44; Bar-coding System: Concept and Applications in Seafood Industry - 48; Model Marine Plywood Boat for A.P. Fishermen Launched by Kerala Fisheries Minister : Veli, Trivandrum : 3 Oct 2001.

Regulars : Editorial ~ Trout Farming Expansion in Himachal - 5.

And a collection of new items

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BARC's Food Technology Scientist's visit to Visakha and Kakinada in A.P., Barc

A team of scientists consisting of Dr. D.R. Bongirwar, Head, FTD, Dr. J.R. Bandekar, Dr.(Mrs.) A.S. Kamat, Dr. V. Venugopal and Dr. S.B. Warrier of FTD, BARC, accompanied by Dr. S.Basu, Senior Scientist, Central Institute of Fisheries Education, (CIFE) Mumbai, visited Visakhapatnam and Kakinada in A.P. from 3 to 6 June 2001 to survey the current aqua farming practices and the application of Hazard Analysis Critical Control Point (HACCP) in the farms and marine products processing units. The visit was coordinated by Dr. K.R. Prasad, President, Confederation of Indian Aquaculture Industries Welfare Organisation, Visakhapatnam and Dr. G. Venugopal, Officer-in-Charge of the sub-centre of Central Institute of Fisheries Education at Kakinada.

The team first visited the plant of M/s Jasper Aqua Exporters Ltd., Visakhapatnam, where shrimp (*Paeneus monodon*) is processed in block-frozen and individually quick frozen forms. The plant has 20 t day capacity, although currently they are processing only 6 tonnes per day, due to shortage of raw material. Dr. Bongirwar appraised the senior managers of the company the advantages of radiation for quality improvement of fishery products and gave to them the brochures on seafoods processing prepared by BARC.

The team later visited a shrimp hatchery, namely, The Andhra Pradesh Shrimp Seed Production Supply and Research Centre (TASPARC), located at Visakhapatnam. TASPARC supplies seeds of *Penaeus monodon* and also Scampi (*Macrobrachium rosenbergii*) to farmers, besides providing advisory services on scientific aqua farming.

On 4.6.2001, the scientists participated in a meeting of aquaculturists, quality control other officers, processors and officials including those from Central Institute of Fisheries Technology (CIFT) sub-station, Visakhapatnam and MPEDA, at the Conference hall of Hotel Meghalaya, Visakhapatnam. While Dr. D.R. Bongirwar spoke on applications of radiation for food preservation, Dr. S.B. Warrier, made a presentation on the preservation and hygienisation of seafoods using gamma radiation. Dr. V. Venugopal explained the importance of value addition in seafoods. Dr.(Mrs.) A.S. Kamat and Dr. J.R. Bandekar gave in details of the microbiological and plant quality management aspects of seafood irradiation. In the following discussion, a general opinion emerged on the need for mandatory irradiation of seafoods for their conservation and hygienization. Dr. Prasad emphasized the need for arranging a workshop on radiation technology in fish processing industry with special reference to HACCP for the benefit of seafood processors, quality control inspectors and aquaculture farmers. Participants in the meeting were of the opinion that all efforts should be made to persuade Government of A.P. to set up a radiation processing plant for seafoods in the coastal area of Andhra Pradesh. Dr. Bongirwar assured all technical help in fulfilling this commitment, in case funds came from A.P. Government and seafood exporters.

The scientists also visited semi-intensive aquaculture farms at Kakinada, which included a 90-acre farm owned by Mr. Vasant Kumar and a 120-acre farm by Mr. Krishna Reddy, where scientific operations were being carried out to reduce bacterial contamination of cultured shrimp. At the end of the tour, the scientists also visited CIFE's sub-station at Kakinada which is running an experimental farm. Dr. G. Venugopal, Officer-in-Charge explained the activities of the sub-station.

FSI recognised by Mumbai and Andhra Universities

The Fishery Survey of India, Mumbai has been granted permanent recognition by Mumbai University under Section 88 of Maharashtra Universities Act 1994, as a research centre for guiding students for M.Sc. and Ph.D. degrees in respect of Research in Zoology. FSI was earlier granted temporary recognition from January 1991 by the University.

Board of Research Studies and Principal, College of Science and Technology, Andhra University decided to recognize the Fishery Survery of India (HQs), Mumbai and its Base at Visakhapatnam as centres of Research leading to M.Phil and Ph.D. degree of Andhra University w.e.f.27-2-2001. FSI is also in the process of getting recognition for its other operational bases from the respective universities in order to give opportunity to more students having aspiration in research activity and to enable them to register for their studies.

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Vol. 21 No. 8 FISHING CHIMES NOVEMBER 2001

Estd : 1981

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CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
Visakhapatnam, India
RESOURCE CENTRE MANGALORE 24/12/01

FISHING CHIMES

Trout Farming Expansion in Himachal

Pursuent to a proposal submitted by the Government of Himachal Pradesh, it is learnt that the Government of India has provided special financial assistance of Rs. one crore to that State for implementing a scheme on - "Promotion and Development of Coldwater Aquaculure in Himachal Pradesh", as a 100% Centrally Sponsored one. The scheme envisages (i) Substantial financial assistance to trout and carp fish farmers ranging from Rs.20,000/- to 25,000/- per unit and first year inputs @ Rs.10,000/- per unit; (ii) Expansion of existing trout farms of the State; (iii) Setting up of an additional feed-mill; and (iv) Programme on habitat restoration of selective trout and mahseer stretches of the State.

The sanctioning of this Assistance Scheme by the Central Government is, in fact, a recognition of the excellent work under the Indo-Norwegian Trout Project, Patlikuhl (Kullu Valley) accomplished by the Fisheries Department of Himachal Pradesh under the leadership of its Director, Dr. Kuldip Kumar. The project succeeded in evolving the much-needed viable technology of production of trout seed on a large scale as well as compounded artificial feed for rearing table-sized trout. The project could also generate keen interest among trout farmers of the upland areas of the State. Under the new trout farming scheme, each farmer would be given financial assistance of the order of 50% of investment needed to the extent of Rs.25,000/- per raceway. The assistance for purchase of first-year inputs viz., trout seed and trout feed has been limited to Rs.10,000/- per farmer. Similarly, in the case of running water carp farming unit the financial assistance has been enhanced to Rs.20,000/- against Rs.4000/- currently being given including the cost of inputs. It is a great advance that the department proposes to set up 25 trout farming units and 100 carp farming units during the current year alone.

The promotion of fish farming in the State would go a long way under the Centrally Sponsored Project on the anvil for exploiting the fishery potential of the fast-flowing high altitude streams/tributaries on the one hand and for generating employment among the hill inhabitants on the other.

Concomitant to this expansion of the farming programme in the State, the project also includes other related components viz., expansion and remodelling of existing trout farms in the State so as to increase their capacity of trout seed production; and (ii) establishment of an additional feed-mill so as to meet the soaring fish feed requirements of the category of new fish culturists now coming up in the State. Another component of the scheme relates to 'Habitat restoration' which envisages the utilisation of angling potential of selected stretches of the State's streams for trout and mahseer fishing. It is learnt that under the 'Habitat restoration' scheme, work would be undertaken for deepening of certain stream beds through removal of silt, and widening of stretches and stocking them with trout yearlings. Based on the success of this excercise, it is good that other streams/tributaries would be taken up for bringing about such habitat improvement, as being planned.

There is good news that, in another significant decision the Norwegian Government has agreed in principle to provide financial assistance of Rs.50.00 lakhs for the setting up of a disease investigation pathological laboratory at Patilkuhl trout farm. A formal proposal for providing the grant is understood to have already been sent to Norwegian Embassy through Government of India. The establishment of such a diagnoistic laboratory, the need for which is keenly felt, would remove problems of disease cure and control now faced by trout culturists, due to the lack of this facility. The laboratory would be equipped with the latest equipments for histological studies and identification of bacterial, viral, fungal and protoplasmic pathogens. It is understood that another proposal has also been taken up by with Norwegian agencies for training of in-service personnel in the prophylactic and curative aspects of trout diseases and this is in the right direction..

As a follow up to the initiation of number of a Central and State sponsored subsidy-oriented schemes in Himachal for the promotion of carp and trout farming, it is learnt that the Himachal fisheries department has initiated measures to intensify the connected "Extension" activities. In this context, it is learnt that it has been decided to utilise the services of All India Radio, Shimla by the department, in broadcasting regularly, selected talks on the subject by Fisheries Experts. An agreement to this effect been signed with AIR, Shimla, to start 'Fisheries School' which envisages direct interaction between the department officials and registered fishermen/fish farmers. It is learnt that an extension capsule has been designed by the department covering 13 serials to be broadcast within a period of three months. Under the said scheme the provision seems to be that all the registered fishermen would have the option to write letters to AIR, Shimla, incorporating their queries regarding any problems being confronted in the fish farming programmes, it is stated. These would be suitably answered by the experts of the department and broadcast by A.I.R., Shimla.

It will be good if similar programmes can be taken up in other states with trout farming potential, such as Arunachal Pradesh, Sikkim, Tamilnadu and Uttaranchal.

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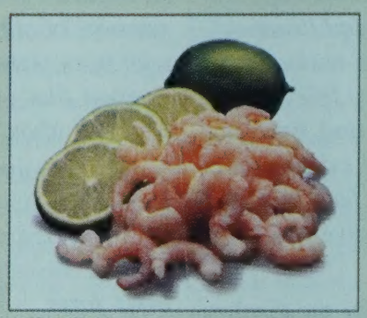

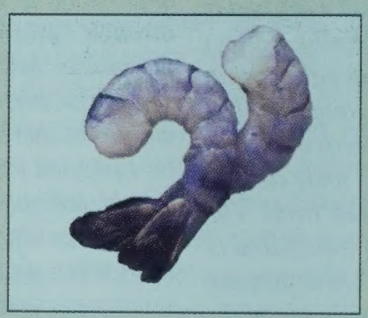

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Irradiation for Preservation of Perishable Food Items like Seafoods

K.Devadasan
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Central Institute of Fisheries Technology
Cochin - 682 029

There is general agreement that seafoods will be the only viable answer to the growing protein needs of the ever increasing human population. Land resources have their limits and sea has been seen as the final *annadaatha* or food provider. But this perception is also now changing. Almost all countries are already optimally exploiting their productive coastal and nearshore waters. Further, culture of marine species in demand, is another step taken to meeting the growing protein needs. Now the hope is pinned on oceanic resources like cephalopods, tunas, mesopelagics etc. Ironically, about 40% of the world fish catch is wasted due to various reasons like rejection of untargeted species caught, improper handling and consequential spoilage, reluctance and lack of appropriate technology to diversify and produce attractive value-added products from low value fish etc.

Indian seafood industry is predominently shrimp based and is mostly export-oriented. The internal market is made to depend mostly on low quality, low value fish only, as quality species of high value are mostly exported. This trend has placed the exporters at the mercy of the sophisticated buyers of Europe, Japan and the US. The importers demand lower prices and on account of this the exporters have to often suffer huge losses and humiliation at the hands of the importers. The rejection of exported products by these countries is often attributed to the presence of pathogenic or toxigenic bacteria in them. Hygienic handling and processing, and adopting the Hazard Analysis Critical Control Point (HACCP) concepts have been solving these problems to a considerable extent. Despite this, the microbiological quality is always a Democles sword hanging over the exporters' head. A possible solution to this problem is irradiation, which is now permitted for fishery products in India and in many western countries. The marine products processing industry today is a high-tech food processing industry adopting state of the art technology for fishing as well as fish processing. It is time for the industry to reflect on the benefits and also on disadvantages, if any, in adopting irradiation as a method of ensuring the microbiological quality of their products without any harmful side effects.

The seafood industry provides direct as well as indirect employment and also nutrition to millions of rural poor, especially the weaker sections of the society, both men and women. However, with the introduction of stringent quality standards by the advanced countries like those of the European Union, USA and Japan, our processing plants are today gearing up at a faster rate to meet the required quality standards prescribed by the importing countries. Our immediate target is to cross the Rs.10,000 crore mark in seafood exports. For achieving this target, we have to bring down the rate of rejection of our exported seafoods on grounds of poor microbial quality for which low dose irradiation, as mentioned above, can be a good method if used in combination with conventional processing, undertaken in hygienic conditions.

Food irradiation is a process for the treatment of food products to improve microbial safety and to enhance their shelf life. The chemistry, technology and commercial aspects of food irradiation have been discussed in a number of articles and books over the years. Electromagnetic radiations, namely gamma rays and X-rays (5 MeV) having shorter wave length (<300 nm) and higher energy than the visible radiation, can cause ionization by removing electrons from the outer shell of atoms and molecules. Generally, ionizing radiation emitted by radioisotopes cobalt-60 and caesium -137 are used for food preservation. When ionizing radiation is applied to food, the major effect is the splitting of water molecules to yield free radicals and hydrogen peroxide. Free radicals are highly reactive chemical species from which the useful effects of irradiation originate. In foods, they persist in hard and bony materials such as the shell of shellfish. In general, the site most sensitive to irradiation is DNA and modifications to the DNA of bacteria can result in their death or inability to reproduce. Food pathogens and food spoilage organisms can thus be destroyed by irradiation. Parasites and insects can also be killed with very low doses of radiation. Irradiation can, therefore, be used to improve food safety, extend shelf life and minimise losses. It is already an approved process for preventing sprouting in potatoes and onions during storage. The energy of all types of radiation is measured in electron volts, eV or more normally MeV (10^6ev). The SI unit for the measurement of radiation dose is the Gray (Gy). A dose of 1 Gy is the absorption of one joule of energy per kg of food. (The units previously used to measure irradiation dose were rads (rad=0.01 Gy).

The FAO/IAEA/WHO Joint Expert Committee on Food Irradiation (JECFI), has declared that the irradiation of any food upto an overall average dose of 10KGy causes no health hazards. On the basis of JECFI's findings the Codex Alimentarius Commission (CAC) devel-

oped general standards for irradiated foods and a Recommended International Code of Practice for the operation of radiation facilities used for treatment of foods. According to the Code, the limiting maximum dose was defined to allow less than 2.5% of the product to receive a dose above 15kGy, which is 50% above the overall average dose of 10kGy. A survey of the literature leads one to the conclusion that microbiological safety of irradiated food is fully comparable with that of foods preserved by other acceptable preservation methods. Irradiation does not, however, prevent enzymic spoilage completely. It is to be pointed out that the gain in microbiological or keeping quality attained by food irradiation has to be safeguarded by an effective control in the food irradiation facilities and by proper care of the product before and after processing. Viruses are highly resistant and cannot be destroyed. Moulds and insects in dried fish can be destroyed at 3 to 5 kGy dose of irradiation. A dose as low as 1 kGy is sufficient to destroy the non-infective parasites without causing significant change in the physico-chemical or sensory properties of the treated food.

The antimicrobial effects of different doses of irradiation have been termed radapertization, radurization and radicidation depending on the extent of irradiation. Radapertization (a la appertization in heat processing like canning, following Apert, the originator of canning) refers to irradiation at doses upto 50kGy. Although the food is effectively sterilised at this dosage undersirable changes in flavour and texture can also occur. Radurization (radiation pasteurisation) refers to usual range of 1-3kGy. These doses will extend shelf life by inactivating spoilage causing bacteria. Radicidation refers to treatment of frozen fishery products at doses between 4 and 6 kGy which destroys non-spore forming pathogenic microorganisms such as *Salmonella* and *Vibrio*.

Irradiation can be used in combination with the usual preservation methods. Shrimp irradiated at 1.5kGy and held on ice had a shelf life of 14-17 days which is much higher when compared to the shelf life of non-irradiated controls. Similarly, salted and boiled chub mackerel irradiated to 2kGy and then held at ambient temperature were reported to have a shelf life of 15 days compared to only three days for the unirradiated control. However, irradiation safety should not encourage unhygienic pre-processing conditions. Processors should not misuse irradiation to export substandard material also. This will, in the long run, become counter-productive and the hard-earned reputation of Indian products in foreign markets will suffer. Good Manufacturing Practices and Good Irradiation Practices will have to be followed in the radiation of seafoods.

Protein and amino-acids can be affected by irradiation but not usually to the extent that they lose nutritive value. For example, irradiation of cod and mackerel at doses up to 45 kGy causes no change in the Biological Value (BV) or Net Protein Utilization (NPU) of the fish which are the accepted tests for protein quality. Some vitamins e.g., vitamins A,E,K are radiation sensitive. Other vitamins e.g., riboflovin, niacin and vitamin D are relatively insensitive. At doses up to 1kGy, nutrient loss is insignificant, but at doses between 1 and 10 kGy, some losses may occur. Doses in excess of 10 KGy can result in significant losses, but these doses are not usually used for the treatment of foods. The changes in flavour, odour, texture and appearance of irradiated foods are small compared to those brought about by heat treatment. While irradiating fatty fish, care should be taken to perform it at low temperatures and in the absence of air. Otherwise free radicals can cause oxidative problems.

It is now well established that irradiation employing isotopes of cobalt 60 having gamma-ray energy levels of 1.17 and 1.33 MeV or Caesium -137 (energy level, 0.66 MeV) will not induce radioactivity in the treated food items. Radioactivity cannot be induced using electron or X rays at the maximum permitted energy levels of 10 and 5 MeV respectively. In a comprehensive survey Bavna reported 1223 studies on the wholesomeness of 278 irradiated food items including feeds and fishery products and concluded that irradiated seafoods are safe for human consumption. As mentioned earlier, irradiation is already an accepted practice for preventing sprouting in potatoes and onions. Irradiation treatment involves high capital investment and requires a critical minimum capacity for economic operation. Skilled manpower, enforcement of safety standards etc., are the other requisites. Operational or running costs are comparatively less. It can be done at a central facility working under the control of competent trained personnel only. Countries like USA, Netherlands, Bangladesh, Brazil, Chile, U.K., Vietnam, Belgium etc. have cleared irradiation as a method for preserving seafoods. In India, irradiation of seafoods has been approved by the Government of India, as per Gazette Notification dated 2nd May, 2001 reproduced on the following page (Annexure).

To sum up, in this era of protein saving, irradiation can be considered as a good method for increasing shelf life and hygienisation of fish products. Some countries still have reservations about irradiation, for fear it may make foods carcinogenic. Available evidence shows that this is an unnecessary fear. The Indian marine products exporters fear that once irradiation is accepted as a commercial practice even unirradiated high quality shrimp/fish exported by our country may be viewed with suspicion by sceptic importing countries. There are now good methods for detecting irradiated fish. It is for the exporters to consider these aspects along with the benefits offered by the irradiation facility. However, it is to be emphasised that it should not lead them to complacency and to compromise on high standards of hygiene in processing plants. Also irradiation must

be done under the most stringent control by highly trained staff only.

ANNEXURE

Govt. of India Notification on Food Irradiation
MINISTRY OF HEALTH AND FAMILY WELFARE
(Department of Health)
FINAL NOTIFICATION
New Delhi, 2nd May 2001

G.S.R.320 (e) - Whereas certain draft rules further to amend the Preservation of Food Adulteration Rules, 1955 were published as required by sub section (1) of section 23 of the Preservation of Food Adulteration Act, 1954 (37 of 1954) in the notification of Government of India in the Ministry of Health and Family Welfare (Department of Health) number G.S.R. 785 (E), dated the 29th September 2000, in the Gazette of India, Extraordinary, Part II, Section 3, subsection (I), dated the 29th September 2000 inviting objections and suggestions from the persons likely to be affected thereby before the expiry of a period of sixty days from the date on which copies of the Gazette of India in which the said notification was published, were made available to the public;

And whereas the copies of the Gazette of India were made available to the public on 30th September 2000;

And whereas the objections and suggestions received from the public on the said draft rules have been considered by the Central Government;

Now, therefore, in exercise of powers conferred by Sub-section (1) of section 23 of the said Act, the Central Government, after consultation with Central Committee for Food Standards, hereby makes the following rules further to amend the Preservation of Food Adulteration Rules, 1955 namely:-

1. (1) These may be called prevention of Food Adulteration (6th amendment) Rules, 2001
   (2) They shall come into force on the date of their publication in the official Gazette

2. In the Prevention of Food Adulteration Rules, 1955, in the rule 74 in subrule (2) in the table after serial number 9 and the entries relating thereto the following shall be respectively be inserted, namely;

Sl.No.	*Name of Foods*	*Dose of Irradiation (KGY)*		
		Minimum	*Maximum*	*Overall Averages*
(1)	(2)	(3)	(4)	(5)
10	Fresh sea foods	1.0	3.0	2.00
11	Frozen sea foods	4.0	6.0	5.00
12	Dried sea foods	0.25	1.0	0.62
13	Pulses	0.25	1.0	0.62

(No.P15014/8/99-PH(Food)
DEEPAK GUPTA, Jt. Secretary

Source : Assocham News and Views - Weekly, May 5 to May 11th, 2001

ASEAN - SEAFDEC 2001
Bangkok, Thailand. November 21, 22, 23 & 24, 2001

This is an international exhibition and conference for the commercial fishing and aquaculture industries hosted by Asean, SEAFDEC, FAO regional office for Asia Pacific, Thai Dept. of Fisheries and Baird Publications, Melbourne, Australia.

The Exhibition: Marine products and services sourced from throughout the world were on display, from vessel design through construction materials to engines, electronics, processing, refrigeration and deck equipment. All the makings of a complete fishing boat, or aquaculture site, including government services, financiers and classification societies, were showcased. The exhibits themselves provided a truly international perspective.

The ASEAN-SEAFDEC Exhibition was held in the 5th floor Auditorium of the Bangkok Convention Centre alongside the Sofitel Central Grand Plaza Hotel near Bangkok Airport.

The Conference: ASEAN in collaboration with SEAFDEC convened the Conference on "Sustainable Fisheries for Food Security in the New Millennium."

The Conference was conducted in response to the urgent requirement within South-East Asia to re-evaluate current fisheries practices and exploitation patterns and to encourage the formulation of appropriate regional policies and strategies, to reconcile the current practices, and to promote the development of sustainable fisheries.

The Conference reviewed the situation and analysed the problems, constraints and present strategies that would assist in the formulation of measures to develop a common vision and purpose for the management of fisheries in South-East Asia in the unified quest for "fisheries sustainability without frontiers".

Participation

ASEAN-SEAFDEC Millennium Fisheries Exhibition attracted stake-holders of all types including boat owners and operators, fisheries administrators and researchers, seafood buyers and processors, aquaculturists, fishing net makers, and indeed, all those interested in the commercial fishing and aquaculture industries.

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Amendment to Prevention of Food Adulteration Rules, 1955 : Notification

"G.S.R.320(E) - Whereas certain draft rules further to amend the Prevention of Food Adulteration Rules, 1955 were published as required by sub section (1) of section 23 of the Prevention of Food Adulteration Act, 1954 (37 of 1954) in the notification of Government of India in the Ministry of Health and Family Welfare (Department of Health) number G.S.R. 785 (E), dated the 29th September 2000 inviting objections and suggestions from the persons likely to be affected thereby before the expiry of a period of sixty days from the date on which copies of the Gazette of India in which the said notification was published, were made available to the public.

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1. (1) These may be called Prevention of Food Adulteration (6th amendment) Rules, 2001. (2) They shall come into force on the date of their publication in the official Gazette.

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Sl.No.	*Names of Foods*	*Dose of Irradiation (KGY)*		
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13	Pulses	0.25	1.0	0.62

APPLICATION OF BIOTECHNOLOGY IN FISH PROCESSING AND PRODUCT DEVELOPMENT

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Large quantities of fish are discarded at sea because it is currently uneconomic to preserve and bring them ashore. Shrimp bycatch is the best known example of such discards. It has been estimated that the average global discards of by-catches is about 27 million t/year/(Alverson *et al.*, 1994). Due to the recent interest in intensive deep sea fishing in the EEZ of India as in other EEZs, lot of deep sea fishes are expected to be landed which may not be immediately acceptable to the consumer due to unfamilarity with shape, size, colour and flavour of the new varieties. Again, due to lack of infrastructural facilities the utility of the fish is under estimated, particularly in developing countries, leading to their use as animal feed. The world's consumption of fish could be increased considerably if these wasted/ underutilized resources could be transformed into acceptable products. Application of biotechnology to fish processing and product development holds a good promise in this direction.

The commercial exploitation of living organisms or their components, eg., enzymes is part of biotechnology. Application of biotechnology in fish processing and product development amounts to judicious use of hydrolytic enzymes - "Fish proteases", either endogenous or derived from micro-organisms to get the desired selective degradation of peptide bonds in protein molecules.

Traditional application of fish proteases in seafood industry

***Fish Protein Hydrolyzate*:** Fish protein hydrolyzate is produced by proteinase treatment of fish protein to break down the protein into smaller sized peptides. This process is a means to transform inexpensive pelagic fish and fish processing wastes to a protein concentrate which can be used in food and other applications rather than as a lower value animal feed. The process involves limited hydrolysis of the ground material with proteases eg., ficin or papain; inactivation of the enzyme, filtration of the hydrolyzate, and concentration and spray drying of the filtrate. FPH is soluble and has been used as milk replacers, food supplements and broth flavourants. By careful control of hydrolysis, it is prossible to suitably modify the functional properties which are useful to food formulations.

The problem with FPH is the formation of bitter tasting hydrophobic peptides (Mohr, 1980) and excessive degradation of protein to peptides and amino acids. Hydrolysis with proteases that have a relatively narrow specificity for peptide bonds can avoid some of these problems (Simpson & Haard; 1987).

***Fish silage*:** Fish silage may be described as a liquid product made from fish or parts of fish and acid. Liquifaction is caused by the action of enzymes naturally present in the fish and is accelerated by the acid which creates the right condition for the enzymes to break down the tissues and limit the growth of spoilage bacteria. Organic acids are mostly used for silage production from fish.

In the beginning, in silage production, inorganic acids such as hydrochloric acid and sulphuric acid were made use of. Although these acids are relatively inexpensive, they are not very convenient because their preservative action first comes into effect when pH value is down to about 2. The feed stuff, therefore, has to be deacidified before it is fed to the animals. The preservation effect of many organic acids such as formic acid, becomes active at a higher pH level (pH 4). In recent years formic acid has been, therefore, increasingly used in silage production.

The rate of liquifaction is temperature dependent. Digestive proteases from fish have maximal activity at 45-50°C (Raa & Gilberg, 1982), solubilized after one week approximately at temperatures between 23 and 30°C (Raa & Gilberg, 1982; Backhoff, 1976). It has been demonostrated that silage can be stored atleast 1.5-2 years but it is necessary to add antioxidants to prevent oxidation of the fat (Raa & Gilberg, 1982).

Use of acid can be avoided by producing lactic acid biotechnologically by adding sugar or sugary grains along with lactobacilli to fish or fish waste. Lactobacilli convert sugar into lactic acid which preserves the fish and creates favourable conditions for the silage (Nilsson & Rydin, 1968). In addition to acid, some types of lactobacilli produce other substances (antibiotic) which increase their preservation effect (Schroder *et al.*, 1980). The bacilli are also considered to prevent oxidation of fats (Raa & Gilberg, 1982). Silage produced by lactobacilli has not yet reached any production level. Feeding experiments with chicken have shown that fermented silage as feed is by no means inferior to silage produced in the conventional manner.

***Fish Sauce*:** Traditional fish sauce fermentation is actually a combination of salting, enzyme hydrolysis and bacterial fermentation. Fish and salt ratios can be varied from 2:1 for marine fish to 3:1 for freshwater fish. Fresh and uncleaned fish

is dumped on a concrete floor and the excess liquid is allowed to drain off. One person throws the fish and salt together while another mixes them together. It is very important that the mixing is done thoroughly. The fish-salt mixture is then transferred into fermentation tank (or vats) which has salt already spread on the bottom. The fish-salt mixture is filled upto 5 cm below the brim. Enough self brine is generated and arragements are made to keep the fish submerged by means of some wooden plank and heavy weight (stone). While salting is going on, the hydrolysis of fish tissue by fish gut enzymes provides nutrients for bacterial fermentation to begin. The length of time necessary for full flavour of fish sauce to develop varies from 8 to 18 months. After fermentation is completed, the liquid is drained off and saturated brine is added to the residue to extract the left over soluble matters. Traditionally the first and the second liquids are combined to produce first quality fish sauce. Subsequently third and fourth extractions are taken and combined to produce second quality fish sauce.

Salting techniques have been improved. Research reveals that salt is used only to prevent putrifactive micro-organisms from spoiling the fish and the maximum amount of salt to prevent the growth of putrefactive cocci is 15%. It is, therefore, recommended that the amount of salt used for the production of fish sauce should be between 18 and 20%. A salt content of more than 15% also inhibits the proteolytic activity of each of the alkaline and acid proteinases from the pyloric caeca and stomach of sardine. It has been established that proteolysis of fish protein comes mainly from the fish gut enzymes.

The proper use of salt and fish with strong enzymic activities helps to cut down the fermentation time appreciably. Now the fermentation of fish sauce takes approximately four months only. There are indications that, apart from the fish gut enzymes, there are also proteolytic enzymes from halophilic bacteria normally present in the salt which cold take part in the protein hydrolysis of fish tissues (Suntinanalert, 1979).

The red colour of the initial sauce gradually disappears and the sauce becomes clearer. The solid matter settles down to the bottom of the tank. It is at this stage that the actual fermentation begins through the specific group of lactic acid bacteria and the typical aroma of fish sauce is developed. There is also a change in the colour of the sauce. The more of protein and liquid hydrolyzes into low molecular weight componds, the better the quality of the fish sauce. *Pediococcus halophilus, Staphylococcus saprophyticus, Micrococcus variance* and *Paracoccus halopenitrificans* have been identified as acid and flavour producing bacteria in Thai fish sauce.

Chitin anc Chitosan

Chitin is non-toxic and biodegradable, with high molecular weight, a naturally occurring polymer of N-acetylglucosamine, which is widely distributed in nature. Even though Chitin is widely distributed in nature, the most practical source of preparing these polymers commercially is from shellfish processing wastes. Chitin in shell-fish waste is tightly assocated with proteins, liquids, pigments and calcium deposits. Therefore these source materials have to be pretreated to remove these components. Current procedure for preparing chitin from shellfish waste consists of two main steps i.e., $CaCo_3$ separation or demineralization with dilute acid or chelating agent followed by protein separation or deproteinization with dilute alkali. Alternatively, the deproteinization process may precede the demineralization step. Subsequent to the demineralization and deproteinization steps, the product may be decolourized with acetone and/or hydrogen peroxide. Decolouration has been also achieved with NaOCL.

Chitin prepared from shellfish waste may be processed further into chitosan by deacetylation. It has been suggested that deacetylation proceeds to about 70% within the first hour of treatment with 50% NaOH solution at 100°C, but it progresses only gradually after this, reaching about 80% in 5 hours. (Wu and Bough, 1978). Further, deacetylation can rarely extend beyond 80% unless the alkali fusion procedure is applied along with fractionation (Muzzarelli, 1977).

Biotechnological Method: The production of chitin with more consistent physico-chemical properties necessitates the use of milder treatments for removing some of the components associated with the shell, such as proteins. Various proteolytic enzymes (i.e. Chimotrypsin, papaine and bacterial protease) were used to deproteinize crustacean shells (Gagne, 1993). Of the three proteases tested, chymotrypsin was found to be most effective, achieving a degree of deproteinization comparable with the chemical approach using NaOH. The optimum conditions established with the response surface methodology approach using chymotrypsin were :pH 8 for 72 hrs. at 40° C and an enzyme substrate ratio of 7:1000 (W/W).

Chitosan may also be prepared from chitin using deacetylating enzymes from microbial sources. The preparation of chitosan from chitin by biological methods may be accomplished either by-

1. Fermentation, whereby cultures of chitin deacetylase producing micro-organisms are inoculated in media containing chitinous substrate, as demonostrated with A. niger mycelia or
2. By a direct treatment of chitin polymers with extracts of microbial chitin deacetylase enzyme (knorr and Klein, 1986).

Of the different strains studied, *Absidia butleri* was found to be the most efficient in producing chitosan from chitin. Some problems associated with the production of chitosan by fermentation include low yields and variation with the age of the culture. On the other hand, chitosan production by fermentation has the advantage of recovering a product with a very low degree of acetylation (5-10%). It is to be expected that appropriate manipulation of processing procedures and control over biosynthesis could alleviate some of the problems with yield, degree of acetylation and wide variation

in molecular weight. Thus, the added advantage with the use of micro-organisms in chitosan production is the potential that exists for genetic manipulation of the organisms.

Current methods for preparing commercial chitin and chitosan result in products with inconsistent properties. Biological methods for preparing these products are milder and thus relatively more capable of recovering products with more consistent properties. With the advances in biotechnology, it is to be expected that the biological approaches would be relatively more amenable to manipulation to result in improvements in yields, as well as control variation in properties in the products recovered from various sources.

"Stick water" viscosity : In the fish meal industry, dissolved protein that is concentrated by evaporation can contribute to excessive viscosity and prevent efficient evaporator operation. The addition of neutral or alkaline bacterial proteinases, when the solids content is above 20%, results in fuel savings and product improvement (Jacobsen and Lykke - Rasmussen, 1984). To achieve rapid viscosity reduction of a protein solution, an endoprotease which catalyzes hydrolysis of the polypeptide chain at random sites is preferable to an exoprotease.

Recent Application of Fish Proteases in the Seafood Industry: In recent years, additional applications of proteases in the seafood industry have emerged. These include selective removal of skin, hydrolysis of membranes and other supportive tissue enveloping roe, roe sacks and other tissues and recovery of pigment and flavour extracts.

*a) **Skin removal*** : It is difficult to remove the skin of fish by mechanical means. To get over this problem, several methods using enzymes to remove the skin from fish have been developed in recent years. Processes have been described for deskinning of tuna using 60°C steam treatment together with a mixture of proteases and carbohydrases (Fehmerling, 1973); of herring with the aid of fish pepsins at low pH; of squid using a weak salt solution containing papin (Hempl, 1983); and of skate using heat treatment and a combination of protease and carbohydrase. Research is also being carried out to develop an enzymatic process to loosen shrimp shells from muscle tissue prior to peeling (Raa, 1990).

*b) **Scale Removal***: In Iceland, recent studies have emphasized use of enzymes to descale fish. Scales can be gently removed by spraying with water after incubating in a solution of enzymes at 0°C.

*c) **Roe Production***: Proteases, including fish pepsins, have been used to hydrolyze the supportive tissue that envelops salmon and trout roe and roe sacks (Gildberg, 1993). Pepsins apparently split the linkages that adhere the egg cells to the roe sack without affecting the eggs. Research has also been done to produce shrimp roe products using enzymes.

*d) **Membrane Removal***: Other applications of proteases include removal of the collagenous membrane surrounding cod liver prior to canning. The black membrane surrounding cod's swim bladder can also be removed by an enzyme process. The method is used by all swim bladder processors in iceland and it results in an 8-fold increase in throughput over mechanical methods. Proteases have also been used to loosen or remove the intestines from scallop muscle (Raa, 1990). By using enzymes from fish viscera, it is possible to selectively break the tissue which connects the soft tissue to the muscle and gonads (Raa, 1990).

*e) **Seafood Flavourings***: Seafood flavours are in high demand for use in products like artificial crab and fish sausage. Proteolytic enzymes can aid the extraction of flavour compounds from shells and other materials. The taste and volatile components of shrimp heads are recovered by enzymatic digestion using corolase N and Koji or bacterial strains with high proteolysis rates followed by concentration and spray drying (Pan, 1990). Shrimp flavourant can be used as an additive in surimi-based products and cereal based extrusion products like shrimp chips. Enzymes have also been used to recover flavour from oysters.

*f) **Pigment***: Various methods have been devised to recover carotenoid pigments from crustacean wastes for use in the feed of farmed fish and shell fish which depend on carotenoids for their bright red colour. Extraction of shell waste with oil reduces ash and chitin levels and achieves a good recovery of pigment, but it suffers from the disadvantage of yielding a product devoid of protein, thereby decreasing the stability of the carotenoid to oxidation and failing to recover a valuable nutrient. Since about one third of the dry matter in crustacean shell waste is protein, an enzymatic process has been developed to recover the protein along with the carotenoid in its native carotenoprotein state. Proteolytic enzymes are used to recover carotenoprotein from shrimp shell waste. About 80% of the protein and 90% of the astaxanthin pigment from shrimp process waste can be recovered as an aqueous dispersion after trypsin hydrolysis. Protein associated astaxanthin is more resistant to oxidation. (Simpson and Haard, 1985) and is deposited in the skin and flesh of rainbow trout more efficiently than the free pigment.

Other Potential Applications of Fish Proteases in Industry

i) ***Fish Trypsin***: It was found that cod trypsin solubilizes protein at a much higher rate than bovine trypsin. It is known that treatment of milk with bovine trypsin can prevent formation of oxidized flavour. However, trypsin must be inactivated after an appropriate reaction time to avoid excessive hydrolysis of milk proteins. Bovine and cod trypsin were similarly effective in preventing oxidation of milk liquids. However, cod trypsin but not bovine trypsin was completely inactivated by the pasteurization

process. Cod trypsin has also been used to advantage in extracting carotenoid protein from shrimp waste. Pectin methyl esterage causes a problem of juice stability. The heat resistance of citrus esterage is such that pasteurization causes deterioration of the product flavour. Research at the University of Florida has shown that mullet trypsin is effective in inactivating pectin methyl esterage in citrus juice (Marshall, 1990). Another example of a possible application of enzyme inactivation is the treatment of the cuticle of raw shellfish like shrimp so as to inactivate polyphenol oxidase to prevent post-harvest discolouration by the phenolase reaction.

ii) ***Fish Pepsins*****:** Atlantic cod pepsin is now produced commercially in Norway and the product appears to be useful for enzymatic cavier production, skin removal, cheese production and as a digestive aid in fish feed.

iii) ***Chymosin from Marine Mammals*** **:** Chymosin is the principal component of calf rennet, used to form the curd in cheese making. Chedder cheese prepared with the simple extreact of seal gastric protease gave significatly higher sensory score than cheese made with calf rennet.

iv) ***Fish Collagenases*****:** Traditional proteinases used as meat tenderizers are mainly of plant origin. These proteinases currently used for meat tenderization attack both connective tissue and myofibrillar proteins. Thus they can bring about over-tenderization, leading to mushiness and undesirable texture softening. Collagenases have been found to have the desired properties and especially collagenases from marine sources have been shown to offer high quality meat and meat products.

v) ***Plasteins*****:** The term "Plastein reaction" is used to refer to the re-synthesis of high molecular weight protein like substance from an ill defined highly concentrated protein hydrolyzate. Although the plastin reaction has been extensively studied, its extracting mechanism still remains a subject of great controversy. Thus far, plastein formation has been facilitated with proteases like trypsin, chymotrypsin, papain and pepsin and at temperatures between 37 and 50°C, where hydrophobic interactions are relatively more important. However, the inability to produce water soluble plasteins directly poses a limitation to the use of this reaction in the food industry, because hydrophobic products have limited application to food products. Since digestive proteases have high catalytic activity at low reaction temperatures where hydrophilic interactions are favoured, it would be expected that cold adapted trypsins, chymotrypsins and pepsins from fish could facilitate the precipitation of water soluble plasteins at low temperatures for incorporation into certain food products. The plastein reacion has great potential in the food industry where it could be employed to i) improve the quality of protein isolates and hydrolyzates by improving flavour, solubility and nutritive value, ii) prepare gel-like products with excellent viscelastic properties, iii) prepare products with high or low levels or particular amino-acids as dietary supplements for certain target groups, and iv) prepare special types of peptides with important flavour and other properties.

Conclusion

Knowledge on the properties and mechanism of action of proteases from aquatic species, particularly in marine organisms, is growing rapidly and this has been enabling utilization in a variety of processess. Based on the upsurge of interest in these enzymes, it will be accurate to say that the era of marine enzymes technology has started. Thus far, proteases from aquatic species have been produced by traditional means and it is predicted that the rapid advances in recombinant DNA tecnology will enhance their production from fish processing waste as well as from more exotic species on a commercial scale for use in hitherto unexploited reactions.

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Ecofriendly and Sustainable Shrimp Farming Farmers' Meet at Karlapalem, A.P. : 11 Aug 2001

MPEDA's Regional Centre (Aqua), Vijayawada conducted a Farmers' Meet on Eco-friendly and Sustainable Shrimp farming at Karlapalem Village in Guntur dt of A.P on 11th August 2001. The technological and management problems faced by shrimp farmers came up for discussion at the Meet, besides other topical issues like payment of income tax, water cess, lack of diagnostic lab, hatchery problems. About 125 participants representing farming and hatchery sector attended the meeting, it is learnt.

Mr. Dasaratha Maharaju, President, Guntur District Shrimp Farmers Welfare Association inaugurated the Meet. Mr. Anantha Varma Raju, MLA, Baptla, in his presentation, brought to the notice of authorities that the farmers were being forced to pay income-tax for the shrimp produced by them. There being no guarantee of 100% succcess of the crop, he requested the authorities to review the tax burden imposed on shrimp farmers.

Mr. P. Kameswara Rao, Secretary, Guntur district Prawn Farmers' Welfare Association emphasised the urgency of providing Aquaculture diagnostic laboratory at Repalle. The need for such a laboratory was keenly felt by farmers of Guntur coast, he added. It was explained by him that around 10,000 ha had been brought under shrimp culture in Guntur district. He had also requested the authorities to provide a mobile lab with technical assistance. This would enable farmers in every nook and corner of shrimp farming villages of district to learn more and more about shrimp diseases and as to how problems.

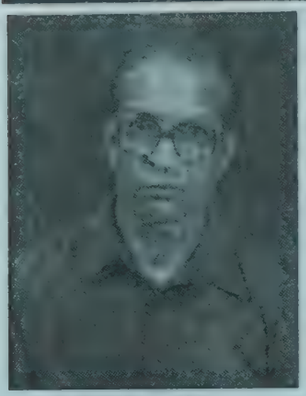
Dr. G. Santhanakrishnan, Joint Director (Aqua), who presided over the Meet provided clarifications to the various points raised by the farmers. He expressed the view that, shrimps being a 100% exportable item, they didnot come within the purview of income-tax. He is reported to have suggested to the farmers to pass on any notice issued by income tax authorities toMPEDA for sorting out the issue suitably. The farmers were told by him that a full fledged diagnostic laboratory would be established by MPEDA in due course in Vijayawada. He also said that for the time being three laboratories had been established at Bhimavaram, Vijayawada and Nellore for screening the white spot virus for which a nominal fee was being charged. The farmers listened to his presentation with absorbing interest on how disease spread in shrimps vertically and horizontally. He exhorted the farmers to treat the discharge water from shrimp farm ponds before letting out through ETPs. He had also cautioned them not to use any antibiotics in shrimp farming activities, as such a practice might entail rejection by importers.

The Meet came to a close with a vote of thanks by Mr. Sampath Kumar, Assistant Director, RC (Aqua) at MPEDA's office in Vijayawada.

Sanitech

Chlorine dioxide has been known for many years to be a very powerful disinfectant in the gaseous form. Using modern technology, VETCARE VAP Ltd introduced 'Sanitech', the stabilised chlorine dioxide in a precursor form in solution, according to a news item in MPEDA's Sept 2000 newsletter. It is stated that this is a powerful disinfectant, effective against a wide variety of bacteria like *E.coli*, *Salmonella* sp, *Staphylococcus* sp, *Streptococcus* sp, *Pseudomonas aeroginosa*, *Listeria* and various other pathogenic bacteria and fungi like *Candida albicans*, *Aspergillus fungatus*, *Trichophyton mentagrophytes*, according to the manufacturers, it is stated. It is pointed that Sanitech is as effective against various viruses and moulds. For more details it is suggested that Vetcare VAP Ltd., IS-40, KHB Industrial Area, Yalahanka New Town, Bangalore - 560 064 may be contacted.

Mr. A.K. Pradhan: Gujarat's New Additional Chief Secretary for Fisheries



A.K. Pradhan

Mr. Ashwini Kumar Pradhan, IAS, has taken over as the Additional Chief Secretary for Ports and Fisheries, Government of Gujarat on 11th September 2001.

A senior IAS officer of the 1996 batch, Mr. Pradhan is basically a Civil Engineer with a Post Graduate Diploma in Management from the prestigious Indian Institute of Management, Ahmedabad. He has earlier held very important positions in the Government of Gujarat (such as the Secretary for Labour & Employment, Planning and Finance) and in the Ministry of Finance, Government of India.

Mr. Pradhan's immediate concern, as far as the Fisheries Sector is concerned is to intensively expand the landing, berthing and allied infrastructure facilities for the marine fishing industry in the State in a purposeful manner. This concern stems from the acute problems faced by the South Gujarat Fishermen at the New Ferry Wharf (*Bhav cha Dhakka*) in Mumbai, and the congestion in the existing major and minor fishing harbours in the Saurashtra - Kachchh coasts. He is planning to develop landing centres at Maroli and Dholai (Valsad District) and Port Albert Victor (Amreli District) on a war footing in view of the present difficulties of the south Gujarat fishermen. Parallelly, the existing fishing harbours of the State (especially the major ones at Veraval, Mangrol, Porbandar and Jakhao) are proposed to be taken up by him for expansion to accommodate and handle additional fishing fleet.

Other programmes to be implemented urgently for the fisheries sector, according to the new Addl. Chief Secretary, are augmenting the fishery resources through sea ranching and aquaculture, introduction of suitable GRP Trawlers for financially viable marine fishing operations, developing housing and other social infrastructure for the fisherfolk (especially in the tribal sector), and organising supplies of implements to support capture fisheries and marketing of fish in the hinterland.

Fishing Chimes wishes Mr. Pradhan all success in his new assignment.

New feed organism

Scientists at Argent Laboratories have created a biologically engineered microorganism which they claim is more superior nutritionally than any other live feed organism. Called Cyclop-eeze^{R}, the tiny crustacean is cultured in a hypersaline lake near the Arctic Circle.

The orgnism has been biologically altered to produce unusually high levels of omega-3 highly unsaturated fatty acids (HUFAs) which are known to be essential to the development and overall health of aquatic animals and important in human nutrition. Cyclop-eeze^{R} also has the highest level of astaxanthene compared to any other organism.

The new organism, claims the company, presents the aquaculturist with a new superior feed organism for use in larval and growout culture of fish, shrimp and other aquatic organisms. Cyclop-eeze^{R} is available in deep frozen and freeze dried form.

Portable temperature recorder

Ryan Instruments has launched a new portable strip-chart temperature recorder, the EZT. It is designed specifically for in-transit monitoring of perishable products.

The EZT records ambient temperatures in the range from -20°F to +100°F with an operating accuracy of 2 deg F throughout the range. In addition to the easy-to-understand operating instructions in both English and Spanish, the convenient view-window allows easy documentation of the chart header and current temperature. Instruments are available in day spans of 5, 10, 20 and 40 days.

Fish finder

The new Simrad ES60 series of echosounder is designed to allow the operator to choose an 'all-in-one' sounder or build his own system by choosing various modules to suit individual needs. The system allows one to decide on bridge configuration and choice of multiple transceivers and configuration of one's own screen presentation.

With the hand-held rollerball, one can set different windows on the screen for echogram, bottom expansion, A-Scope and digital depth. Other features include memorising of favourite setting; up to four independently operated frequencies; unlimited range selections; colour printer output; separate gain-settings for fish schools and bottom and split beam feature with tuna fish size and volume.

Small vessel autopilot

Navitron System's NT921 autopilot is specifically designed for use by small professional vessels (typically 11-20 m LOA). It provides a powerful combination of steering system control and interface facilities based on an extremely intelligent control unit which is clearly marked and simple to operate.

Special features include builtin Radio Navigator Interface for automatic track steering between way points; dual channel heading outputs for radar stabilisation, etc; and automatic stability adjustment which compensates for rudder speed variations.

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National Workshop on Sustainable Participatory Development and People's Management of Natural Resources

Kesla, Hoshangabad (M.P.) : 1-2 Nov, 2001

Report *from* : R.P. Tuli

A National Workshop on the Captioned topic was held on 1-2 November, 2001 at Kesla, Hoshangabad, M.P., headquarters of Tawa Matsya Sangh (TMS). There were eighty three registered participants, apart from a large number of members of primary societies of TMS. Notable participants were M/s. Neel Kanth Rath, Economist, Indian School of Political Economy, Pune, Sidharaj Dhadha Sarvodaya leader, Jaipur, G. Venugopal, IAS, of National Institute of Rural Development, Hyderabad, Yogendra Yadav, of Center for Study of Developing Societies, Delhi, Gajanand Khatu, Ex. General Manager, Apna Bazar, Mumbai, Dr. Suresh Mishra, Dr. Anwar Jafri from Eklavya, Bhopal and Mr. N.D. Koli of National Fish Workers Forum. The venue of Workshop was in a rural setting far away from city. There was no garlanding, no welcome speeches. The whole exercise was subject-oriented with no frills. Experts and grass root level workers shared their views on participatory management and its role in the development and management of resources, with the five years long success story of Tawa Matsya Sangh, providing inspiration for the presentations and discussions.

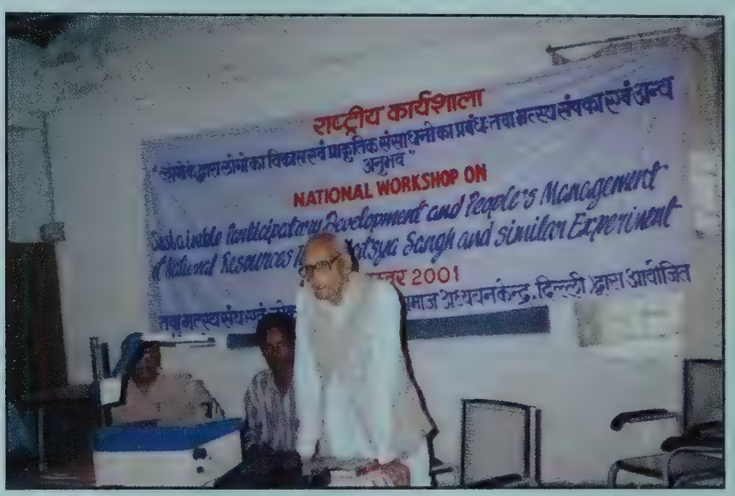
There were two field visits also, one to Kotmi and another to Banglapura village, both located on the periphery of Tawa reservoir. During the visits the participants had the opportunity of experiencing the buoyant nature of tribal members of the primary societies, their frustrations and their resolve for the future.

There were four sessions of the Workshop, two each respectively on 1 and 2 November, 2001.

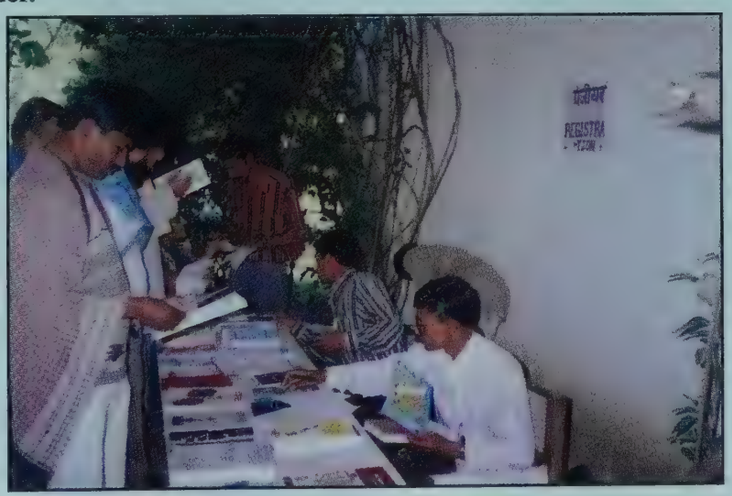
Session I

This was chaired by 93 year old Mr. Sidharaj Dhadha . Notable speakers were Messers Sunil of Kisan Adivasi Sanghtan, Neelkanth Rath, S.N. Chatterjee, Director of Fisheries, Madhya Pradesh (Rtd.), and Dhadha. Mr. Sunil told the participants that Tawa Federation was registered in October 1996, as Tawa Displaced Tribals Fish Production and Marketing Co-operative Federation, with head office at Kesla (Dist. Hoshangabad). Giving details, he said that fisheries of Tawa reservoir (12,145 ha) was leased to the Federation (popularly known Tawa Matsya Sangh) for five years from December 1996. Tawa Matsya Sangh (TMS) organised 38 primary co-operatives comprising 1242 members mostly belonging to displaced

Mr. Sunil, one of the organisers of Tawa Matsya Sangh, addressing the participants. L to R : Mr. Rath, Indian School of Political Economy Pune, Mr. Sabbular, President of Tawa Matsya Sangh and Mr. Sidharaj Dadha, Senior Sarvodya leader.



Mr. Sidharaj Dadha, Senior Sarvodya Leader addressing the participants.



Registration.

A village level meeting of tribal fishermen.

Participants at the Workshop.

tribals. Their capabilities were, strengthened by imparting training and equipping them with 150 boats and about 9061 kg of gill nets. According to data provided by him, as a result of efforts of TMS, average annual fish production of Tawa reservoir had increased from about 123.80 t per annum during 1991-92 to 1994-95 in pre - TMS period, to 327.60 per annum during 1997-1998 to 2000-2001during TMS period. As a consequence of enhancement in production, average annual productivity had increased to 26.90 kg per hectare during 1997-1998 to 2000-2001. 477 members of primary co-operatives were actively engaged in fishing. Share capital of TMS had increased from Rs. 0.31 lakh in the beginning to Rs. 5.44 lakhs in 2000-2001 (April 2000 to March 2001). Rs. 17.40 lakhs were now in Banks as fixed deposits of TMS.

Sunil further explained that, on account of improved marketing and enhanced fish production, average annual income of fishermen had increased from about Rs. 4426 (1991-92 to 1994-95) to Rs. 22,708 in 2000-2001. Minimum income during TMS period was Rs. 6563. He emphasised the need for continuation of fishery lease of Tawa reservoir in favour of TMS so that Tawa fisheries could be further improved with dedication and to ensure continued availability of beneficial means of living to displaced tribals on an improved scale.

Mr. Neelkanth and Mr. Dhadha , with their background of vast academic and field experience, brought out the role played by TMS in enhancing income from fish production from the reservoir and generating employment. They said these were two unique examples of proper management and development of common resources for the benefit of rural society. Even as a commercial entity, TMS had been continuously in profit without compromising their social obligations. Mr. Rath pointed out that successful and close knit working of Tawa reservoir-based primary co-operatives and their federation was a good concept worthy of emulation at other reservoirs for their fishery development. The system did not leave any room for intervention by the state level co-operative structure.

Both the speakers felt that reservoirs offered scope to rehabilitate, to some extent, those who had been displaced because of their construction. They felt that on account of all round good performance, TMS should have the opportunity of serving its consistent co-operatives and its members, particularly as the Sangh performed well, generating viable results for the benefit of its members. The results. achieved by TMS were unique, they said.

Table-1: Average Price Received Year wise and Market wise

Market	*1997-1998 (in Rs./Kg)*	*1998-1999 (in Rs./Kg)*	*1999-2000 (in Rs./Kg)*	*2000-2001 (in Rs./Kg)*
Local Sale				
Kesla	30.06	28.03	27.03	31.05
Shahpur	-	-	22.94	28.12
Suhagpur	25.37	25.08	21.50	29.97
External Sale				
Howra	33.93	31.04	34.57	35.88
Delhi	26.18	21.54	19.42	37.43
Nagpur	28.17	22.19	15.82	-
Mumbai	-	-	-	28.50
Bhopal	31.90	26.79	27.98	34.05
Khandwa	27.29	26.98	22.15	21.32
Lucknow	-	-	-	34.68
Kanpur	-	-	-	28.97

Supported by data, Mr. S.N. Chatterjee gave an account of technical aspects of progress of fisheries of Tawa (Table-2). He said that TMS had made a determined and devoted effort to handle both developmental and conservational aspects of fisheries of Tawa reservoir with thumping success. Attempts were made to introduce fish seed production in enclosures along periphery of the reservoirs, and steps taken to diversify fishing effort with long-lines and "Passijal" (a type of boat seine). These gears were introduced to promote catching of catfish and medium size carps. In the fish

Table No.2

Fish Production, Seed Stocking, Income of Fishermen, Management Regime etc.

Year	*Fish Production*	*Yield/ Hectare*	*Stocking fish seed*	*Stocking rate/ha*	*Total wages paid*	*Average No. of Fishermen*	*Average income per fisherman*	*Exploitation System*	*Management Regime*
(in M.T.)	*(in Kgs)*	*(in lakhs)*		*(in lakhs)*			*(in Rs.)*		
1	2	3	4	5	6	7	8	9	10
1975-76	0.330	- -	0.90	7	N.A.	N.A.	N.A.	Royalty	Mgmt.Fisheries Dept.
1976-77	21.600	1.770	2.20	18	N.A.	N.A.	N.A.	-do-	-do-
1977-78	82.200	6.760	2020	18	N.A.	N.A.	N.A.	-do-	- do-
1978-79	42.100	3.460	1.50	12	N.A.	N.A.	N.A.	Deptt. Fishing	Mgmt. & Mktg. Fisheries Corpn.
1979-80	34.750	2.860	-	-	0.69	40	1725	-do-	-do-
1980-81	76.072	6.260	2.14	18	1.65	73	2260	-do-	-do-
1981-82	38.163	3.140	10.34	85	1.08	59	1831	-do-	-do-
1982-83	40.866	3.360	8.94	74	1.1	60	1833	-do-	-do-
1983-84	58.878	4.840	2.96	24	1.8	72	2500	-do-	-do-
1984-85	16.792	1.380	2.09	17	0.87	34	2559	-do-	-do-
1985-86	27.815	2.290	2.08	17	0.87	34	2559	-do-	Mktg. Lifting contract
1986-87	111.108	9.140	7.85	65	3.99	100	3990	-do-	-do-
1987-88	144.857	11.950	8.96	74	4.76	115	3252	-do-	-do-
1988-89	59.525	4.890	15.46	127	2.57	102	2520	-do-	-do-
1989-90	165.313	13.600	21.37	176	6.31	125	5040	-do-	-do-
1990-91	130.694	10.750	20.67	170	6.1	120	5083	-do-	-do-
1991-92	146.008	12.050	24.85	205	7.32	110	6655	-do-	-do-
1992-93	88.665	7.300	16.43	135	4.57	116	3940	-do-	-do-
1993-94	84.420	6.960	27.48	226	4.92	177	2780	-do-	-do-
1994-95	176.180	15.500	17.96	148	11.2	220	5091	Outright Auction	Privatisation
1995-96	93.538	7.700	34.21	282	N.A.	N.A.	N.A.	Royalty	-do-
1996-97	93.229	7.680	31.69	327	11.09	169	6562	Lease cum Royalty system	Collective Mgmt. TMS Kesla
1997-98	245.811	20.240	26.13	215	30.45	171	17807	-do-	-do-
1998-99	344.811	28.350	27.90	230	47.15	205	23112	-do-	-do-
1999-00	393.163	32.370	29.47	242	52.12	213	24469	-do-	-do-
2000-01	327.175	26.940	32.19	265	47.46	209	22708	-do-	-do-

marketing sector, both local and external markets had been explored for getting higher price and for promoting local consumption of fish (Table 1).

Mr. G. Venugopal, who had studied TMS as part of his research project was of the view that TMS working was an example of success in achieving economic output, community participation and providing livelihood security to displaced tribals.

Session II

This session was chaired by Mr. R.P. Tuli, Director of fisheries M.P. (Retd.). Dr. Som Dutt of Powarkheda Centre of Central Institute of Fisheries Education, Bombay (Deemed University) gave an account of training facilities for production of fish seed extended to TMS and members of its societies. He also gave an

account of progress of Tawa fishery development. He was of the view that the increased number of fishing days and skills of manpower engaged in fishing had played a key role in enhancing fish production from Tawa. Mr. Neelkanth Rath spoke on growing income gap between urban and rural areas. According to him, success of TMS in raising average annual income of fisherman from Rs.4426 to Rs.22,708 was a good example of how such a gap could be reduced by efficient use of local resources.

Others who spoke in the session included Messers Anurag Modi of Shramik Adivasi Sanghatan, Betul, Gajanan Khatu and Shyam Bhore of Gramodya University, Chitrakoot. In all, seven persons spoke at this session. Most of the speakers emphasised the importance of people's participation and all of them quoted the performance of TMS as an example of a successful experiment.

Session III

Chaired by Dr. Anwar Jafri of Eklavya, Bhopal, six persons including Mr. Dhadha spoke at this session. Speakers expressed themselves unanimously in favour of promoting resource-based co-operative structure with no linkage with any state level organisation.

Session IV

This session was chaired by Mr. Gajanan Khatu, Ex-General Manager, Apna Bazar, Mumbai.

There were seven speakers at this session. Mr. R.P. Tuli pointed that lower individual weight limit of exploitable Catla should be raised to three kg from existing two kg. He suggested that fishermen should get value for his fish catches as a percentage of market price received by the federation instead of fixed wages as followed at Gobindsagar reservoir, Himachal Pradesh. He also opined that the word 'labour wage' gave an impression that a fisherman was a labourer, while he was the basic grass root functionary of the organisation. He suggested that reference to fishermen as "labour wage" needed to be replaced by some appropriate term. During discussions, Rath suggested that there should be a limit on the strength of membership of a society. Others including Mr. Yogendra Yadav of Centre for Study of Developing Societies, Delhi, Mr. N.D. Koli, Secretary, National Fishworkers Forum spoke at the session. They mostly dealt with community based use of resources by co-operatives. Organisational level support was promised by all the speakers to TMS in their full future endeavours.

Recommendations

Following broad recommendations emerged out of the two days Workshop.

1. Considering the enduring success of the two-tier co-operative structure of Tawa Matsya Sangh for a continuous period of five years, it is recommended that this structure be considered as a model for fisheries development of all large reservoirs in the country.
2. Considering that reservoir fisheries hold great scope for rehabilitation of displaced persons, there should be a policy under which reservoir-based right of rehabilitation is reserved for the affected people.
3. There should be a limit on the membership strength of a society. It should be linked with production potential and sustained employment and income generation of the members.
4. There should be a sustained training input on a regular basis for improvement of management of the organisation and fishing skills of fishermen.

Swarms of Trigger Fish (*Odonus niger*) in Wadge Bank & South-West Coast of India

In the coastal waters of Wadge Bank of south-west coast of India dense schools of balistids appear periodically at the surface waters close to the coast. Red foothead trigger fish (*Odonus niger*, Ruppell, 1840) is by far the most dominant species of balistids in this area. Although other species of balistid family such as *Sufflamen fraenatus*, *Abalistes stillatus*, *Balistes vetula* are taken along with red foothead triggers, their contribution to fishery is negligible. The fish feed on benthic animals found in shallow waters of Lakshadweep, Wadge bank and off south-west coast of India upto a depth of 100 m. They are commonly caught as trawl by-catches, but not specifically fished by trawlers in coastal waters since their commercial importance is limited to fish meal production.

It is apparent that the quantity of *Odonus niger* in the sampling area varied seasonally with the maximum concentration in the post-monsoon season of August to March with a peak during the period of December to February. The habit of the fish in spending part of the time feeding on the bottom and part near the surface makes them available to surface, mid-water and bottom gears. At times it contributed the entire catch of trawls operated in Wadge Bank, frequently clogging the cod-end and throat meshes of the net. For reasons not fully understood, it was observed that during the peak season of August - October, large quantities of these species move closer to the coast and occasionally spill over the beaches of Kanya Kumari, Kolachal, Vizhinjam and Thiruvanthapuram. Dead trigger fish formed a substantial portion of the 'debris' collected by bottom trawls operated in the shallower depths of this area. The fact that fishes of different length size are represented in the dead ones indicates probably climatic changes responsible for death. One possibility is the effect of exceptionally strong current experienced in Wadge Bank during north east monsoon on swarming trigger fish school together with the stirring action of waves result in carrying the fish close to the shore. The northerly set current near the inshore waters probably carry these, being not so ace swimmers, further north of their natural distribution zone i.e. North of Latitude 9°N.

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Religious Aquatic Sanctuary for *Rita rita* (Ham) in River Ganga

Satish K. Srivastava, N.S. Nagpure, B. Kushwaha and A.G. Ponniah
National Bureau of Fish Genetic Resources
Canal Ring Road, Telibagh, PO-Dilkusha
Lucknow - 226 002, India

Rita rita (Hamilton) belongs to the family Bagridae and is one of the economically important freshwater catfish found in India. The availability of this species varies location wise. It has been reported as a rare species in Bihar (Prasad, 1994) and Narmada basin (Rao *et al.*, 1991) and threatened species in Uttar Pradesh (Pandey and Awasthi, 1994). Although this species is found in the plains of Ganga river, it occurs more commonly around Kanpur area in Uttar Pradesh, despite high aquatic pollution prevalent near Kanpur. This fish has been selected as a model species for pollution monitoring by Central Inland Fisheries Research Institute, Barrackpore because of its sedentary nature and availability in both industrial and non-industrial stretches of the estuary (Mukhopadhyay *et al.* 1987). Some factors such as suitable breeding grounds, availability of adequate food, work done on ranching of fishes etc., can be attributed for the abundance of *Rita rita* in Ganga river near Kanpur region. However, the most important factor seems to be the presence of no fishing zone at Bithoor, which is a known pilgrim place, famous for the temple of Lord Brahma, Valmiki ashram, birth place of Lav-Kush, and Pandav ghat. In addition to these, there are many temples and ghats built during ancient times which are still existing on the banks of Ganga river. This place is of historical importance. This was one of the centres of activity during mutiny of 1857 and was ruined by the Britishers. Large numbers of pilgrims visit this place throughout the year. Many devotees release small fishes in the river as a religious practice and feed puffed rice and wet flour balls to the fishes. Fishing is totally banned in the adjoining areas of the temple and sacred ghats, since time immemorial.

A survey was made in Bithoor during the month of August for studying the availability of fishes, their size and their food and feeding habits. It was then observed that among other fish species, *Rita rita* was abundantly available in sizes varying from fingerlings to adults. This fish was reported to be a bottom dweller and carnivorous in nature and gut contents of this fish were seen to consist mainly of insects, crustaceans such as small shrimps, gastropods, lamellibranchiates and small fishes (Dutta Munshi *et al.* 1990; Devi *et al.* 1992). The feeding habits of *Rita rita* found here seem to be interesting since it was observed that these fishes voraciously feed upon puffed rice and wet flour balls offered by devotees.

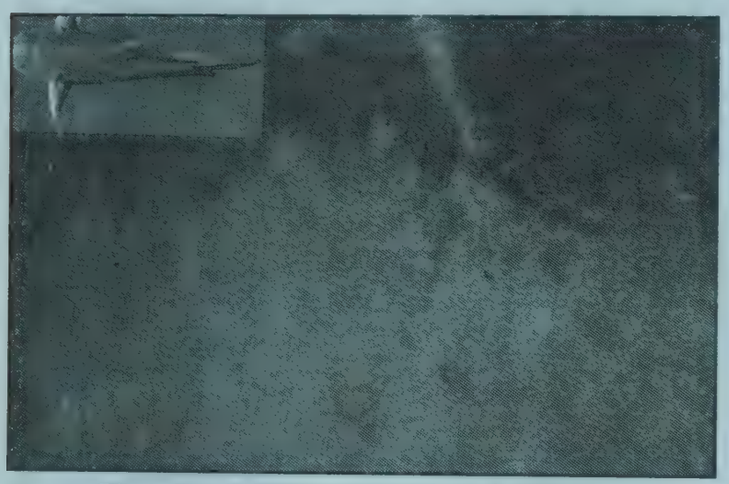

Fig 1. *Rita rita* in main stream of Ganga river

Fig 2. Temples of Bithoor

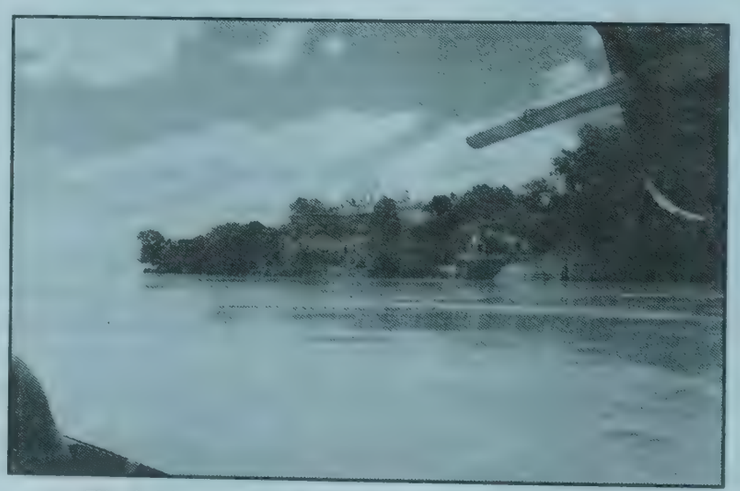

Fig 3. Views of ghats on Ganga river at Bithoor

There are many places in India where local communities, on religious grounds, have banned fishing. Most of them are,

however, ponds and lakes where native fishes are abundantly available. Bithoor is one of the good examples where fishing is banned in the mainstream of Ganga river which has helped in the conservation of *Rita rita*. If similar practices are followed in other rivers also, they may contribute towards conservation of endemic fish species, particularly the endangered species.

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An alternating seabass culture can ward off WSSV in shrimp crops

For the shrimp farmers who are hard hit by the white spot viral disease, sea bass culture between two shrimp crops may prove to be a solution that provides relief from the disease.

Fisheries scientists of Central Institute of Brackishwater Aquaculture say that culturing the sea bass in shrimp farms would help the farmers to break the WSSV disease cycle and restore profit levels.

The sea bass (*Lates calcarifer*) is a finfish that grows very fast and attains marketable size of 2-3 kg in just six months. It is immune to the white spot disease.

The sea bass is now splashing into the fish farming scene with the Central Institute of Brackishwater Aquaculture (CIBA) located at Muttukkad in Chennai having standardised its culture technology. Readers are aware that CIBA is now in a position to transfer technology related to sea bass seed production through induced breeding, evolved by it some years back.

Sea bass is known as 'Calcutta Bhetki' in West Bengal, 'Koduva' in Tamil Nadu, 'Narimeen' in Kerala and 'Pandu Chaapalu' in Andhra Pradesh.

The standardisation of culture technology of sea bass is significant in the context of erratic availability of sea bass in the market. It has high consumer demand. The usual market price of the fish is about Rs 120/- per kg. It is a coveted fish because of thick boneless meat quality. Its delicious flesh quality has rendered it as a much sought after fish in export markets too.

Intervention of one crop of this fish is stated to help in breaking the white spot viral cycle in shrimp farms. Further it would support a long term sustainable crop rotation of sea bass and shrimps.

It is stated that a farmer who goes in for the sea bass-shrimp rotation can secure a net profit of Rs. 2-2.5 lakhs in a 14-month cycle, in a one ha farm. The profitability from this newly suggested cropping system is believed to be steady and sustainable.

Dr G.R.M. Rao, CIBA's Director is reported to have said the sea bass seed produced at his institute was being sold to progressive farmers in Andhra Pradesh, Kerala and Tamil Nadu. Feedback from these growers is stated to be very encouraging as most of them reported good yields and success in breaking the white spot virus cycle in shrimp culture.

The Rajiv Gandhi Centre for Aquaculture at Myladuthurai in Tamil Nadu has organised the small fish farmers in the district to go in for profitable and steady sea bass farming.

It was pointed out that the availability of sea bass seed from the institute would be augmented several fold with the implementation of an Indo-French sea bass seed production project. This project has received Rs.4.73 crores as financial aid from the French Government.

Shrimp Market Shift

According to Roche Aquaculture Centre, Asia Pacific, Bangkok the shift toward Thai and other Asian shrimp in the global market would continue this year and perhaps into 2002 as well. Increased production of shrimp in Thailand in 2000 was the result of the ongoing white spot epizootic in most Latin American shrimp producing countries. Shrimp production in Thailand reached an all-time record in 2000, approximately 290,000 mt. The increased production was fueled by higher prices for most of the year: 20%-25% higher than in 1999. China, India, and Vietnam have also benefited from the Latin American problems. The centre has not yet evaluated the trends in 2001. The Table below indicates the magnitude of the shift.

Country	*1999*	*2000*	*% change*
Thailand	115,000	126,446	+10%
China	12,055	18,203	+51%
Vietnam	11,891	17,718	+49%
Ecuador	30,937	19,097	-62%
Mexico	34,012	29,074	-17%

Fish Farmers' Meet

Sambalpur, Orissa: 10 July 2001

A farmers' meet was organised by the Asst. Director of Fisheries-cum-C.E.O., FFDA, Sambalpur as part of Special Fish Farmers' Day celebration held on 10 July, 2001 at the Conference Hall of the office of the Dy. Director of Agriculture, Sambalpur.

Most of the progressive Fish Farmers of Sambalpur district, besides District Level Officers and Fisheries Field Officials, participated in the Seminar. Mr. L.K.Mohapatra, Addl. Dist. Magistrate, Sambalpur, presided over the function. Mr.D.B. Tarai, Deputy Director of Fisheries, (NZ), and Mr. Dibakar Kar, Deputy Director of Agriculture, Sambalpur were the guests of honour at the function, as Keynote Speaker and Guest of Honour respectively.

Mr. P.K. Mishra, Asst. Director of Fisheries-cum-C.E.O., FFDA, Sambalpur, welcoming the dignitaries, delegates, and progressive fish farmers, said that 10th July had been declared by the Govt. of India as Special Fish Farmers' Day to focus attention on the important role played by the aquaculture sector in promoting Indian economy and to lend further guidance and encouragement to the fish farmers in their endeavour. He added that the significance of 10 July was that it was on this day in the year 1957 Dr. Hiralal Choudhary achieved breakthrough in inducing major carps to breed at Angul in Orissa.

Mishra also spoke on prospects of aquaculture in Northern Aqua Division of the State. He explained in detail, for the benefit of the farmers, modern scientific fish culture practices and called upon the fish farmers to adopt them for augmenting fish production from their tanks. He added that the production could be raised to 3 mt/ha in the first stage of their endeavour and this would be the starting point for the upgradation of their economic status. He also told the farmers about induced breeding techinques and on production and culture of fast growing hybrid fish seeds.

The Deputy Director of Agriculture, Sambalpur, explained about developed integrated technologies of agriculture related to fisheries and development of fish culture through Krushi Sahayak Kendra (KSK) scheme i.e., under Agriculture Policy of the State Government. He had also exhorted the fish farmers possessing agriculture farms to adopt integrated farming technologies. He mentioned that devastation of crops by pests was a major problem for farmers who usually sprayed crops with tonnes of chemicals which affected fish in the ponds.

Mr. Artatrana Boxi, one of the leading fish farmers of Sambalpur district narrated about the success of intensive fish culture adopted by him in his own tanks in Dengsargi village under Dhankauda block. He said fish culture was more profitable compared to agriculture. He had also exhorted the farmers to adopt modern culture practices in their tanks to optimise fish production therefrom.

P.K. Mishra, Assistant Director of Fisheries-cum-C.E.O., FFDA, Sambalpur, spoke on issues related to present status of fisheries resources and their utilisation in Sambalpur district, and the on-going fisheries developmental programme and policies. He also narrated the issues related to low productivity and production in relation to soil/water quality, topography and climatic condition of Sambalpur district. He highlighted the need for adoption/implementation of modern scientific Intensive/Composite Polyculture and Integrated fish culture practices by the fish farmers to boost up fish production to a level of 3 mt per ha to start with. He invited the fish farmers to improve their credit absorption capacity so that more credit could flow into fisheries sector. In the end, Mishra exhorted the farmers to achieve eco-friendly sustainable development of Inland fish culture in Sambalpur district.

The Additional District Magistrate, Sambalpur, in his presidential address, said that 21st century was the age of liberelisation, privatisation and globalisation. He called for adoption of convergent technology in which Agriculture, Horticulture, Fisheries and Veterinary Sector all would be co-related. He told about development of fisheries through self-help groups. He felt fish farmers should be assisted to augment their incomes from fish culture in order to meet the requirements and to upgrade their present status of living in the society. He called the fish farmers to adopt modern scientific fish culture practices in order to optimise fish production, and through it to earn more.

Mr. Prasanta Mohanty, an experienced journalist, opined that district officials should recommend to government to initiate purposeful measures to help fish farmers in the marketing of fish at reasonable prices.

P.K. Mishra proposed a vote of thanks to all participants.

Special Fish Farmers' Day Celebration in Pondichery

In September 2001 issue of Fishing Chimes, we published a report on Special Fish Farmers' Day Celebrations held on 10th July 2001. A report on the celebrations in Pondichery (Pondichery, Karaikal and Yanam) could not be included therein because the particulars were received late.

The Department of Fisheries and Fishermen Welfare, Pondichery, celebrated Special Fish Farmers' Day on 10th July, 2001 by way of extending 100% grant-in-aid to fish farmers in Pondichery and Karaikal regions. In Pondichery region, the Minister for Fisheries, Mr. A.V. Subramanian, released a grant-in-aid totalling Rs.58,500/- to thirty fish farmers. The Regional Executive Officer, Karaikal distributed grant-in-aid totalling Rs.39,750/- to twenty three farmers. In Yanam region a group meeting of registered fish farmers of FFDA was organised under the Chairmanship of the Regional Executive Officer (Fisheries), Yanam. At this meeting the methodology in respect of composite fish culture was explained to the farmers.

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Danio, locally available ornamental fish of Meghalaya

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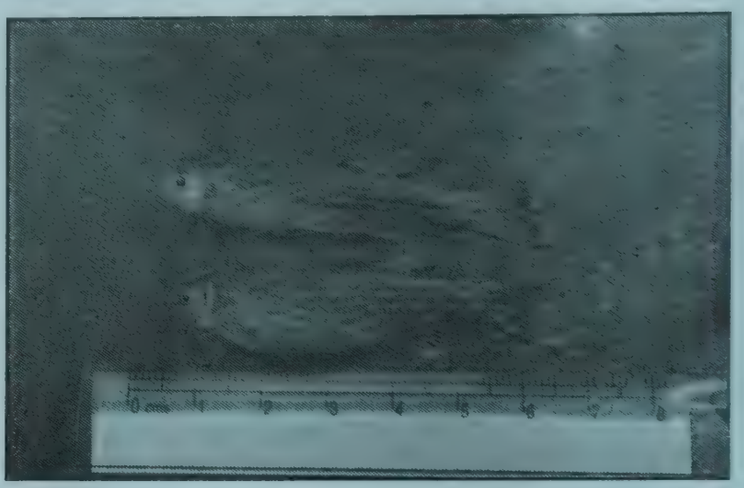
Deptt. of Pisciculture, St. Anthony's College
Shillong, Meghalaya - 793001

Danios are considered to be one of the most popular locally available ornamental fishes in Meghalaya, found in lotic as well as lentic waters. Meghalaya is one of the important Hill States in North-Eastern India and its capital city Shillong is situated at an altitude of 1496-meter msl. The fisheries resources of Meghalaya occur in about 5,600 km rivers and streams, 8430 ha. reservoirs, 375 ha. beels and lakes and 2000 ha. of ponds and tanks. Danios are hardy, active swimming and shoaling fishes. The fishes adapt to adverse ecological conditions e.g. Low pH, low temperature and even dirty water. They are colourful ornamental fish with wide distribution.

A wide variety of *Danio* species are reported which include Zebra Danio (*Brachydanio rerio*), Leopard Danio (*Brachydanio frankei*), Blue Danio (*Brachydanio kerri*) and Spotted Danio (*Brachydanio nigrofasciaturs*). Zebra Danio has got horizontal stripes of royal blue (appearing darker because of their narrowness), which cover the silver/gold body from head to tail. The stripes are continued into the caudal fin of the males as well as in the female. Giant Danio appears to have thin blue stripes on a pale gold background. The fins are pinkish-blue in mature fishes during the breeding period. The females may be more rotund than males. Pearl Danios are medium sized fish with a blue, pearl lustre to their flanks. A blue horizontal line extends backwards from below the dorsal fin into the caudal fin and is bordered by blue/violet bands. The fins are yellowish. The beauty of this fish can be appreciated better when viewed is reflected light. Females may be recognized easily by their rounded abdomen. This fish needs plenty of swimming space. There is a gold variant of Danio called the Golden Danio. Danios prefer to be part of a shoal and move in pairs. They are very active fish. They feed with flakes or small live foods that are naturally present in the aquatic system.



Danio Fishes of Meghalaya

The different streams of Meghalaya where the Giant Danios found are: the Mowover stream (Mawlai), the Sumer stream (Ribhoi district), the Umsning stream (Umsning) of the west Khasi hills and Tangtla river, Mynthkung river and Mynsar river of the Jaintia hills. In Ribhoi area, these fishes are found in all the paddy field having accumulated water or in the shallow channels surrounding the fields. The size of adult Giant Danio ranges from 2 to 7 cm in length. It is surprising to note that the Zebra Danio is found in Meghalaya mostly in stagnant waters of Thadlaskien lake and Nongthymmi area. The Pearl Danio is found only in the Umsning stream. Although they prefer a temperature a range of 22-25°C and pH of 6.5-7.2, they are very much adopted to hills streams of Meghalaya and exposed to low temperture of 4°C to 5°C and pH of 5-6. During extensive winters these fishes are not seen swimming freely in the open waters but they borrow themselves in the mud and hide in crevices in the streams and ponds. They breed naturally in paddy fields under the agro-climatic conditions of Shillong. The male Giant Danio is thinner and has brighter colours than the females during the breeding season. Danios also can be successfully bred in capitivity with the pituitary hormone as the inducing agent. Slightly acidic water is favourable for breeding of Danio.

Although a number of studies have been carried out on various aspects of different species of Danio, virutally nothing is known in particular on the Danios that occur in Meghalaya. It is not yet known how this species adopts itself to conditions of Meghalaya although it is quite likely that the fishes have some physiological and structural specialization. Due to pollution hazard from different sources, the population of Danio is seen to be declining day by day and this is a challenge facing the fisheries scientists. Detailed studies will not only help to protect this fish but will also open the door for earning foreign exchange.

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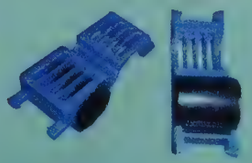

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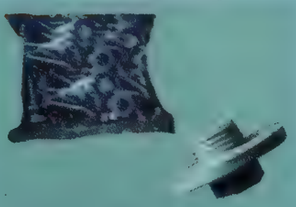

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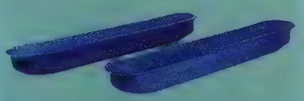

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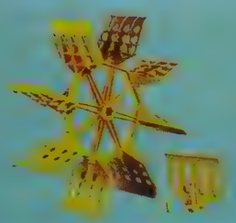

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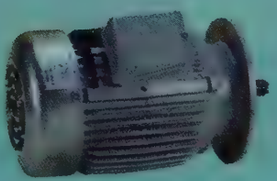
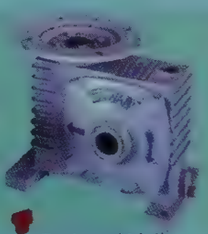
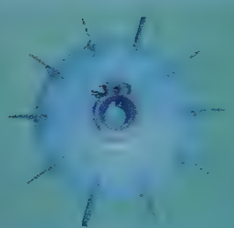


Motor



Reducer(14:1)



Motor fan

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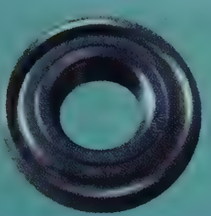

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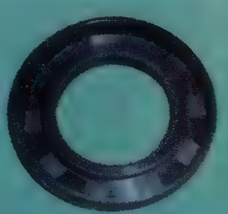

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Worm Gear Wheel (14:1)

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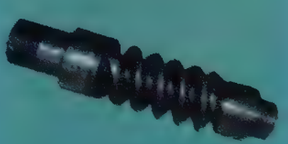

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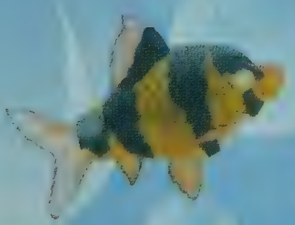

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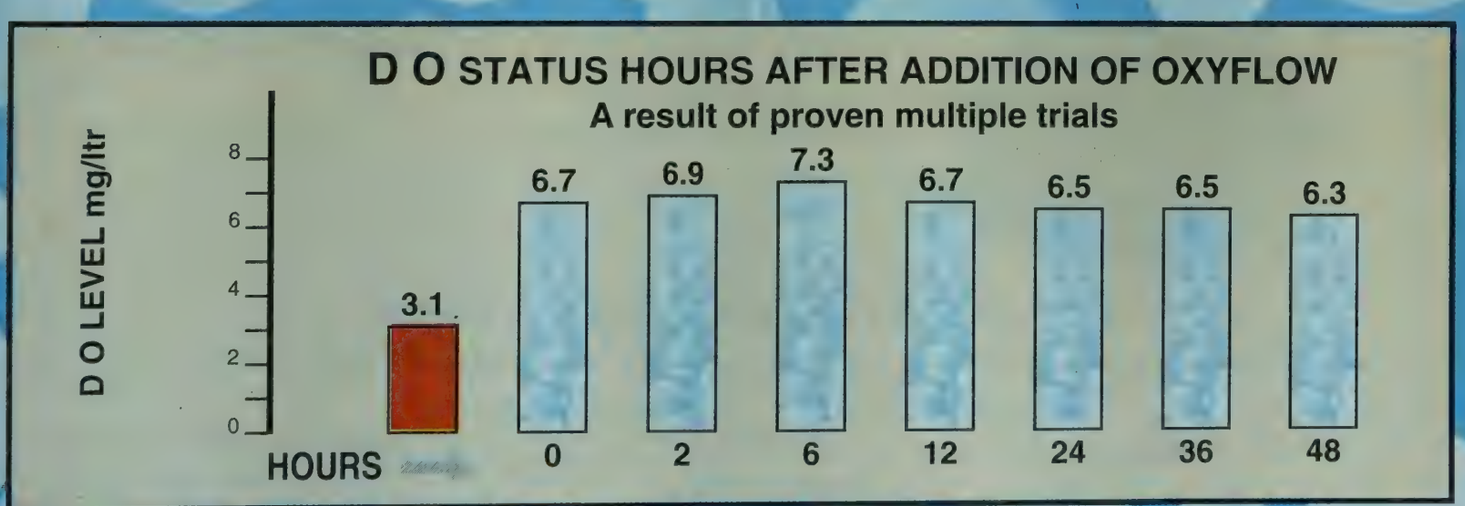

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Indian Seafood Industry : Emerging trends and Banking interventions

O.Henry Francis
Chief Manager (Rural Dev.)
Agri Technical Cell, Local Head Office
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Chennai

India has exported 4,40,473 mt of seafood valued at Rs. 6443.89 crores during the year 2000-2001 registering an increase of 23.41% and 25.94% in terms of quantity and value respectively over the previous year. It is a commendable achievement compared to the exports of Agricultural products, which have seen a marked decline in the past couple of years. The credit for this goes to Indian seafood industry, MPEDA (Marine Products Export Development Authority) and people connected with this line of activity.

Shrimp plays a dominant role in our Seafood export earnings, contributing 31% by volume and 72% by value. India's shrimp exports, which were stagnating at around 50,000 tonnes through seventies and eighties rose to over 1,00,000 tonnes in a decade, in spite of stagnating catches from traditional fishery resources. This is mainly due to shrimp culture undertaken mostly by small farmers in coastal areas. However since mid-nineties shrimp production (culture and capture) started plateauing on account of dreaded white spot disease and Supreme court's judgement, regulating culture activities in Coastal Regulation Zone (CRZ).

Issues facing the industry

i. Lot of capital is created; but full capital utilization is not seen.

ii. The industry has not created a strong material base. Thre is over dependenceon capture which has to be normalised.

iii. Domestic market is lacking. Dependence is mainly on export.

iv. Overdependence on one candidate ie., Shrimp for export is counterproductive.

v. Exports confined mostly to Japan, USA and UK - Exports are insignificant to other countries.

vi. Marine resources exploitation level is not uniform.

Exploitation levels as at present are :

Upto 50m depth - 98%

50-100m depth - 75%

Beyond 100m depth - 25%

vii. Lack of quality

Shrimp Culture

The estimated potential for brackishwater shrimp culture in India is 11,90,900 ha of waterspread area (WSA). (See Table 1) However the actual culture is done in 1,41,837 ha WSA (11.9%) as in 2000-2001. This explicitly indicates that there is a vast potential for increasing shrimp production, through coastal aquaculture. The per ha shrimp production in our country is very low i.e., 684 kg/ha/year. If the yield can be doubled, the overall production of shrimps will rise to 1,94,200 tonnes from the present level of 97,100 tonnes. This will also enhance our seafood exports in U.S. dollar terms.

Indian seafood exports suffered a temporary setback two years back, when the EU had banned Indian seafood on account of unhygienic fish landing centres and unsatisfactory processing facilities. Of the 412 seafood processing units, over 103 units now conform to the international quality norms such as HACCP (Hazard Analysis and Critical Control Points) and EU standards.

Shrimp Capture

Indian capture fisheries also suffered a setback due to the Non-tariff trade barriers. USA, at one point of time, refused to import Indian shrimps on the plea that Indian fishermen did not fix TEDs (Turtle Excluder Devices) in their gears. The Olive Ridley turtle is an endangered species and it comes to the Bitherganika estuary on the east-coast (Orissa) for nesting. The U.S government wanted the Indian government to ensure that these animals do not become extinct. The Government of India approached WTO and pleaded that adequate measures have been taken to protect the turtles; As a result, the decision on the issue went in favour of India.

As already mentioned, Indian exports depend mainly on shrimp. Finfishes such as tuna are underfished, in spite of premium prices available in the global market. There are about 2,20,000 fishing crafts operating along our country, of which about 1,10,000 crafts are motorized. There are about 170 large fishing vessels, of which only 45 are operational, due to various reasons. Indian annual marine fish production is at a stagnating level of 2.8 million tonnes, for the last 5 years.

India should evolve its deep sea fishing policy in a manner that would encourage sustainable fisheries. Some of the points to be kept in view in this context are :

i. Exploitation of deepsea lobster and shrimps should be done only after taking into account sustainability of their populations.

ii. Purse seine nets should not be allowed.

iii. Tuna fishing should be Dolphin friendly.

iv. Fishing holiday for 45 days in a year is to be enforced in all maritime states.

Table 1

State wise details of shrimp farming in India (2000-2001)

State	*Estimated potential brackishwater area (ha)*	*Area under culture (ha)*	*Production (mt)*
West Bengal	4,05,000	42,067	21,079
Orissa	31,600	8,000	7,360
Andhra Pradesh	1,50,000	71,000	53,100
Tamil Nadu	56,000	1,087	3,792
Pondicherry	800	—	—
Kerala	65,000	14,705	7,327
Karnataka	8,000	3,515	2,800
Goa	18,500	650	996
Maharashtra	80,000	426	315
Gujarat	3,76,000	316	424
Total	**11,90,900**	**1,41,837**	**97,096**

v. Certain fishing zones may be closed for certain months in a year eg., Gulf of Mannar, Gulf of Kutch.

How to make Shrimp Culture an environment friendly activity

i. As the traditional flow-through culture system may lead to water quality problem, it is advisable to switch over to a phased water treatment system for sustaining shrimp farming. The major components of the system are :

a. *Sedimentation*: A sedimentation pond where the organic matter settles down at its bottom. Addition of alum enhances sedimentation process.

b. *Chemical treatment*: Lime is added to adjust pH and demineralization.

c. *Biological treatment*: Certain fishes and plants are used for biological filtration. eg., Milk Fish, Mullets @ 1000 nos/ha.

ii. **Reservoir ponds**: These ponds are constructed at the 'Intake' level to filter organic impurities.

iii. **Stocking density**: 10 animals / sq.m.

iv. **System of culture**: Extensive/modified extensive system of culture to be practised [Preferably outside CRZ (Coastal Regulation Zone)].

v. **Use of Chemicals/Antibiotics** : These should be discouraged. However, probiotics are found to have a significant role in the enhancement of immunity to animals.

Hatcheries

There are about 283 shrimp hatcheries with a production capacity of 13,882 million post-larvae. Andhra Pradesh and Tamil Nadu together have a share of 89% of the production, leaving other maritime states far behind. (See Table 2) After a set back in the mid-nineties, the hatcheries have restarted production, but the full potential is yet to be realised.

Dual Purpose Hatcheries

As Scampi culture (Fresh water prawn) is gaining momentum, particularly in Andhra Pradesh, the existing hatcheries can be converted into dual purpose hatcheries in the present scenario to facilitate production of both shrimp and scampi larvae, in order to make them financially viable.

Focus on alternate candidates

Mariculture and coastal aquaculture should be given priority in order to have a higher market reach.

i. ***Scampi culture***: Scampi production in India was at 7140 tonnes (1999-2000) against 61,868 t of annual Chinese production of scampi. There is vast scope for increasing scampi production through inland freshwater culture. There is an excellent export market for this species especially in E.U. It is a hardy species and resistant to disease, compared to shrimp.

ii. ***Tilapia culture***: World production of farmed Tilapia rose almost three fold from 3,63,326 mt to a whopping 9,71,811 mt in the 10 year period from 1989 to 1998. The USA has emerged as the main market for Tilapia over the last few years. Imports increased from 3400 mt in 1992 to 37,575 mt in 1999 valued at US $ 82 million. The bulk of production from aquaculture comprises Nile Tilapia.

iii. ***Mud crab culture***: Mud crab (*Scylla serrata*) is a highly valued export item. This animal, which has good market in South East Asian countries, can be exported in live condition. The main drawback noticed in this line of activity is lack of crab hatcheries and dependence on wild crablets for culture which is not ecologically sustainable. There will be a surge in this activity as soon as hatchery technology is standardised.

iv. ***Sea bass culture***: Seabass (*Lates calcarifer*) is identified as one of the candidate species suitable for coastal brackishwater culture. It commands a high market price both in domestic and export markets. The per ha productivity is 2.7 tonnes in 8 months of culture period.

v. ***Pearl culture***: Excellent market exists for marine pearl culture. The pearl oysters can be cultured in coastal areas, where salinity of the water is around 15-35 ppt. The culture techniques are available with CMFRI.

Alternate Destinations

About 43% of our exports are destined to one country, Japan. The USA (19%) and EU (15%) are the other export destinations which offer attractive markets. As there is a felt need for widening our market outlets, South Africa, China, Central Asian Republics and South East Asian countries offer valuable market reach. The slowing down of Japanese economy, weakening of Yen has exposed the gaping holes in our marine products

Table 2

Shrimp Hatcheries (2000-2001)

State	*No.of Hatcheries*	*Production Capacity (in nos. / million)*
Andhra Pradesh	180	10,065
Gujarat	1	48
Karnataka	9	240
Maharashtra	2	51
Orissa	9	445
Tamil Nadu /Pondicherry	72	2933
Kerala	10	100
Total	**283**	**13,882**

export basket. It is heartening to note that MPEDA conducts international trade fairs to promote India Sea food exports.

Value Addition

A number of techniques are available for making innovative products from seafood resources. These include breading and battering, high pressure processing, IQF (Individual Quick Freezing), products from fish mince, surimi and seafood analogues, fish fillets and steaks, MAP (Modified Atmosphere Packaging) and those produced through traditional processing methods such canning, curing, smoking etc.

Most of the processing units continue to follow outdated block freezing system. They have not yet taken to real value addition processing in their units. With the increased net surplus income available to the family and working women accelerating in numbers, the demand has been significantly going up from "Ready to cook" to "Ready to eat" items. Sophisticated machineries are available for production of value-added sea foods. Spiral freezers are used now a days for production of IQF products having capacities from 500 - 2000 lb per hour. The entrepreneurs / units should switch over to such useful machinery in order to sustain their business in the market.

Trends in the Consumer Market

In view of the emerging trends in the consumer market, the undernoted items need attention of processors/exporters.

i. Heat and eat products - saves times and energy

ii. Flavoured products - Taste and value

iii. Products with regional identity - local flavour

iv. Products with good profit margin - lobsters

v. Labour saving products for retail and food service

vi. Unique items available in limited quantity - Tandoori Shrimp, Malabari Crab, etc.

Working Group's Recommendations

Government of India has constituted a special task force headed by the Additional Secretary and Financial Advisor, Ministry of commerce for examining the credit needs of Indian Seafood Industry. A Working group was constituted, to assist the task force. The members of the group were drawn from banks and other institutions connected with the activity. The salient features of Working Group recommendations are as under:

- The Working Group suggested that the banks might consider PBS (Projected Balance Sheet) method, Turnover method, or Cash budget method for assessing the credit requirements of an exporter.

- The Working Group observed that the normal time taken by banks for sanction of credit was 60 - 120 days. RBI has stipulated that the export credit proposal should be disposed within the specified time limit (15-45 days)

- For exporters with a satisfactory track record, the Working Group suggested 3 years "on line credit facility" with inbuilt flexibility to step up - step down quantum of limit within the overlimits assessed.

- The margin money can be stipulated at 15-25%

- Quantum of finance should not be linked to availability of collateral security.

- The following norms may be adhered while assessing the requirement.

i) Sundry Credit for raw materials ~ 5 - 20 days

ii) Packing material & consumables~*30-60 days

iii) Advance payments to fishermen/ Agents for supply of raw materials ~10-21 days

**upto 120 days if procured from abroad*

- As the industry is already having excess capacity, caution should be exercised before financing for creation of additional capacity.

- As existing units have to modernize / upgrade their processing facility in order to meet HACCP / EU norms, the banks can extend term loans to acquire necessary equipments and systems.

- As Networth of the industry has been eroded, the Working Group suggested to Government of India to set up "Technology upgradation fund" to the tune of Rs. 200-300 crores.

- Financing for new Hatcheries and Aqua farms could be taken up, provided they have been cleared by Aquaculture Authority.

- Working Group suggested that SEAI and MPEDA jointly consider setting up an Inspection Agency as an autonomous corporate body to render necessary services to Banks/Financing Institutions for a fee.

Role of Banks

Banks have a pivotal role in the ever-growing seafood industry. Financing for culture, capture, crafts and gears, processing and marketing will go a long way in sustaining this developing industry. This industry provides employment, nutritional security, enables utilization of aquatic resources and contributes to the much needed foreign exchange.

Note: The view expressed by the author need not represent the views of the organization to which he belongs.

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Importance of Trace Minerals in Aquaculture Nutrition

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Minerals, which comprise the ash of biological materials remaining after the organic substances have been completely burnt or oxidised in the body of all animals including fish, are known to be essential for cellular metabolism. Minerals, which are present in fairly large quantities in biological materials, are those of calcium, phosphorus, potassium, sodium, magnesium etc. The principal minerals present in microquantities (or trace levels) are iron, manganese, zinc, copper, cobalt, selenium, chromium and iodine. Fish can get these minerals both from diet as well as from ambient water. The minerals are responsible for skeletal formation, maintenance of colloidal systems, regulation of acid-base equilibrium and for formation of some physiologically important compounds like hormones and enzymes. Mineral deficiencies can cause biochemical, structural aberrations and functional pathologies, which depend on several factors, including the duration and degree of mineral deprivation.

Information on nutritional requirements of fish for trace elements is scarce particularly because many are needed in extremely small amounts and these pose difficult analytical problems too. If excess amount of the elements are ingested and assimilated, toxicity develops. In this communication importance of some of the trace minerals which play significant role in aquaculture nutrition has been highlighted.

Iron: Iron plays an important role in oxidation/reduction reactions and electron transport associated with cellular respiration. It binds to proteins such as haem which serves as carriers of oxygen, in enzymes such as microsomal cytochromes, catalase etc., and in non-haem compounds such as transferrin, ferritin and flavin iron enzymes. The haem molecule has ferrous or ferric ions in the center of a porphyrin ring. Haemoglobin contains 4 porphyrin group per molecule. Myoglobin, a similar type of compound present in skeletal or heart muscle, contains one ferrous porphyrin group per molecule.

In fish, the gill membrane absorbs iron to a certain extent, and the intestinal mucosa is considered to be the major site in this regard. Deficiency of iron induces anaemia, as has been reported in brook trout, yellowtail, red seabream and even in carp. Microcytic, hypochromic anaemia in iron-deficient carp was seen to be characterised by a drop in haemoglobin content and erythrocyte count. Iron deficiency is also known to cause yellowish white liver condition in carp. In channel catfish poor feed utilization and lowering of plasma iron level and transferrin saturation was noted. The hatching rate of rainbow trout eggs was poor when the iron content was low in feed.

It has been demonstrated that fish takes up iron through the gills. Addition of iron (Ferrous sulphate) improved the growth of sword tail, indicating a nutritional benefit from iron dissolved in water. An adequate supply of iron from the diet reduced the dependence on gill absorption of iron (in guppies). Among the different forms of iron, on comparing the effectiveness in preventing anaemia, it was seen that ferrous and ferric chloride were more highly available than ferric citrate. The requirement of iron in fish ranges between 30-170 mg kg^{-1} dry diet.

Feeds of animal origin such as fish meal and meat meal are rich sources of iron, containing about 400-800 mg kg^{-1}, oil seeds 100-200 mg kg^{-1}, while cereals contain 30-60 mg kg^{-1}. The iron from animal sources may occur as porphyrin, myoglobin and haemoglobin but in a complexed form with phytin in cereals. The availability of iron in the various feed stuffs for fish generally depends on its form.

Manganese: Manganese is important for fish and is widely distributed in fish and animal tissue and mainly used as co-factor for the enzymes kinase, peptidase, arginase, succinic decarboxylase, DNAse. Manganese has been implicated in oxidative phorporylation. The mitochondria have a greater concentration of manganese than cytoplasm. It is responsible for normal functioning of brain and proper lipid and carbohydrate metabolism. It has two roles (1) co-factor for enzymes, which form metal-enzyme complexes and (2) as an integral part of metalloenzymes. Manganese activates leucine aminopeptidase.

Manganese deficient diet resulted in poor growth in rainbow trout and carp. In young tilapia, reduction in feed intake, loss of equilibrium, poor growth and mortality in manganese deficient diet were observed. Dwarfism linked to disturbances in bone formation and cataract of eye lens was observed in rainbow trout and carp. A reduction in skeletal manganese content has been noted corresponding to insufficient dietary supply of manganese. The importance of manganese has been felt in broodstock nutrition. The manganese content of the diet influences its level and that of other trace elements in gonads. The eggs produced by broodstock of brown trout and rainbow trout fed on fish meal diets lacking manganese contained only low levels of manganese and poor hatchability.

In carp, manganous sulphate and manganous chloride are better sources

Good growth was recorded in carp provided with manganous sulphate in the diet and it also increased protein synthesis and prevented fat synthesis in liver. The requirement of manganese in fish is 2-20 mg/kg^{-1} dry diet. The content of manganese in fish meal ranges from 4-38 mg/kg^{-1}, depending on the fish. Capelin meal and herring meal contains only 4-12 mg kg^{-1}. Among the plant sources, cereals contain 8-50 mg kg^{-1} and corn 4-11 mg kg^{-1}. Rice bran, wheat middling and corn distiller's dried soluble are good source of manganese.

ZINC: Zinc plays key role in various metabolic pathways. Zinc is connected with prostaglandin in metabolism and also plays structural role in nucleo proteins. Recent research on zinc-gene interactions has revealed the basic role of zinc in controlling growth.

Deficiency of zinc results in poor growth, and lowered digestibility of protein and carbohydrate, probably due to reduced carboxypeptidase activity. Zinc deficiency also recorded eye lens cataract and erosion of fins and skin, and sign of short-body dwarfism. In catfish, diets low in zinc resulted in reduced appetite, low growth, low bone zinc and calcium levels and serum zinc concentration. The mineral composition of common carp gonads was significantly affected by deletion of zinc from the mineral supplementation in a fish meal diet. Fortification of brood stock diets of salmon with zinc increased the content of this mineral in the ovaries of female salmon. In rainbow trout zinc deficiency impairs immunological response. In carps it was found that the availability of zinc was influenced by dietary tricalcium phosphate, but the ill-effect on mineral utilization was less pronounced than in rainbow trout. Tricalcium phosphate was found to be not dissolved in the intestine of carp as it has less gastric juice compared to rainbow trout.

The presence of phytic acid in plant protein sources like soyabean meal or cotton seed meal strongly chelates divalent minerals, including zinc to form insoluble phytates in the intestinal lumen, thus lowering zinc availability. Interaction between zinc and phytic acid in soya bean meal could be the reason for low bioavailability of zinc. To overcome that, heat treatment of soyabean meal by extrusion at 150°C improved growth performance of the diet having soyabean meal. Fish requires zinc at 15-40 mg/kg^{-1} dry feed. Fish meal contains about 80-100 mg zinc/kg^{-1}, whereas the range in vegetable protein concentrates may be 40-80 mg zn/kg^{-1}, cereal grains contain 15-30 mg zn kg^{-1}.

Copper: Copper plays important role in the activity of enzymes such as cytochrome oxidase, superoxide dismutase, lysyl oxidase, dopamine hydroxylase and tyrosinase. Copper metabolism revealed similarities to mammals in the distribution of copper and copper dependent enzymes. Copper levels are high in eyes, liver, brain and heart.

The copper content of their tissue had declined when the diets of carp and rainbow trout had low levels of copper. Copper toxicity causes damage to gills and necrosis to liver and kidney. High levels of copper depressed growth and impaired feed conversion in channel catfish. However, in the same fish copper deficiency affected the activities of cytochrome c oxidase in heart and copper zinc superoxide dismutase in liver. The copper requirement in fish ranges from 3-5 mg/kg^{-1} dry diet. The requirement for copper depends on physiological state of animal, the copper content of the water, and the levels of zinc, iron, calcium and molybdenum, which are metabolic antagonists of copper.

Plant and animal protein feed ingredients are relatively rich sources of copper, providing over 85 mg/kg^{-1}. Metal containinations can cause wide variation in the copper content of processed feed ingredients.

Cobalt : Cobalt is considered as the component of cyanocobalamin (vitamin B_{12}). Cobalt is essential for the synthesis of the vitamins by intestinal microflora, and such bacteria have also been isolated from the intestinal tract of fish. Cobalt is associated with nitrogen assimilation, and syntheses of heamoglobin and muscle protein cobalt binds with insulin and reduces plasma glucose levels.

Dietary cobalt has beneficial effect of growth, and increased erythrocyte count in carp and rainbow trout. Gold spot mullet exhibited better survival and growth. The uptake of cobalt has been demonstrated in trout eggs at the embryonic development stage. Cobalt also plays role on glucose metabolism in carp.

The requirement of cobalt is very less in fish (0.05 - 1.0 mg kg^{-1} dry feeds). High dose of cobalt (0.1 - 5 g Co kg^{-1}) was found to be toxic to rainbow trout. It resulted in haemorrhages in the digestive tract and altered white blood cells count. Lack of cobalt reduced the intestinal synthesis of vitamin B_{12} in catfish.

Selenium: Selenium is an integral component of glutathione peroxidase. The active level of this enzyme in liver or plasma is indicative of selenium supply to the organism. Selenium along with vitamin E is essential to prevent nutritional muscular dystrophy. Selenium is implicated in the metabolism of tocopherol compounds.

Selenium deficiency results in growth depression, loss of appetite, lethargy, reduced muscle tone and mortality. Selenium acts as the principal factor in the protective mechanism against oxidative cellular injury. In the liver the glutathione peroxidase activity is lowered, while glutathione transferase activity and pyruvate kinase activity in plasma were increased. Deficiency signs in channel catfish involved interaction between vitamin E and selenium, but not when either of them alone was deficient. High levels of selenium in the diet have toxic effects, resulting in reduced growth, feed efficiency and increased mortality. When given more than 10 mg se/kg^{-1}, trout developed renal calcinosis. Renal tabules were degenerated, leading to inflammation.

Fish derive selenium from both diet and water. High levels of selenium in water are toxic to fish. Selenium is stored in various tissues, except liver, in its inorganic form. Selenium as selenite is effectively taken up through the gills. Selenium and vitamin E are complementary to each other in their activity and they

protect biological membrances against lipid oxidation.

Fishmeal and marine by-products are rich sources of selenium to fish. Plant materials vary widely in their selenium content. Among the source of selenium, selenomethionine was the most digestible (92%), and fish meal (47%) the least digestible sources of selenium. The glutathione peroxidase (92%), and fish meal (47%) the least digestible sources of selenium. The glutathione peroxidase selenium ratio indicated that selenium supplied as selenite or selenocystine was a better source for plasma glutathione peroxidase than was selenium from selenomethionine or fish meal. Though the comparative availability of selenium is poor, still fish meal based diets generally provide sufficient selenium to satisfy the nutritional requirements of fish.

Iodine: Iodine is associated with thyroid hormones, which regulate the level of metabolic activity in fish. Triiodothyronine (T_3) is the major hormone of the thyroid gland and is supposed to be the active precursor for thyroxine (T_4). In fish, T_3 binds more strongly to plasma proteins than T_4. Its turnover rate in plasma of trout is low when compared to T_4. Both T_3 and T_4 are excreted mainly in bile, but the gills and kidney also a play role.

In Salmon, thyroid hyperplasia (goiter) induced by deficiency was demonstrated nearly a century ago. In goldfish growth is reduced when reared in aquaria containing water with a low concentration of iodine. Iodine uptake by thyroid tissue was reduced in ascorbic acid deficient catfish.

Iodine is taken up from the surrounding water through the gills. As seawater contains more iodine than freshwater, iodine deficiency is more pronounced in freshwater fish. The plasma level of freshwater fish ranges from 0.5 to over 2000 g/dl^{-1}. Freshwater fish depend more on a dietary source for iodine and it is easily absorbed in the digestive tract. Marine plants and animals are rich sources of iodine. Some seaweeds contain up to 0.1% iodine. Normal herring meal and capelin meal have only 5 - 10 mg/kg^{-1}. On the other hand Atlantic white fish meal may contain up to 60-90 mg/kg^{-1}. But iodine content in vegetable protein concentrates is very low.

Chromium : Chromium plays key role for normal carbohydrate and lipid metabolism. Chromium influences glucose metabolism in carp. Chromium salts improved glucose utilization and inhibited gluconeogenesis, may be by modulating the endogenous insulin activity. Chromium supplementation increased weight gain, energy deposition and liver glycogen in tilapia fed on glucose diets. The bioavialibility of chromium depends on its characteristic ability to form co-ordination compounds and chelates. Not much is known on its role in metabolism.

Conclusion

Trace minerals are essential for fish and these play a crucial role in the normal metabolism and life processes. The minerals are required in extremely small amounts in the diet but in excess they cause toxicity. In deficient condition, growth is retarted in general, and impairs normal metabolism in particular. It is also a matter of concern about the potential causes of conditioned trace element deficiencies such as food processing methods, dietary interactions, disease conditions and genetic disorders. Fish can absorb part of the required minerals directly from the water through gills or even through their entire body surface. The minerals absorbed from water do not meet the total requirement and a certain supplementation through the diet is required whether in the natural food or supplementary feed. Once this requirement is met, the normal growth, survival and essential cellular metabolism may be ensured.

Aquaculture Authority's Licenses to Shrimp Farmers

It has been brought to the notice of the MPEDA by several shrimp farmers in Andhra Pradesh that their applications for license from the Aquaculture Authority for shrimp farming have been pending at various levels in the District, State and the Aquaculture Authority. In response, it is learnt that, MPEDA would like to follow up these pending applications with a view to ensuring that the licenses are issued early.

MPEDA is understood to have advised all shrimp farmers who have applied for Aquaculture Authority's licenses for their shrimp farms and who are yet to receive the licenses that they may kindly furnish the following information by post to the Dy. Director, MPEDA, 32-2-10, Prajasakthi Nagar, Vijayawada-520 010, Phone: 0866 - 473305; Fax: 0866 - 481484: 1) Name of the farmer and present full postal address for communication; 2) Tel.Nos. with STD Code; 3) Location of the Farm & Extent in ha; 4) Details of application for Aquaculture Authority's license, application no. and form number (I or III); 5) Whether acknowledgement received from District Aquaculture Authority (Copy may be enclosed); 6) Where the application is currently pending (if known); and 7) Remarks.

Aquaculture Authority's License for availing of MPEDA Subsidy

Several aqua farmers have applied to MPEDA for subsidy for setting-up aquafarms. As per the directions of the Honourable Supreme Court, all shrimp aquaculture farms have to take license from the Aquaculture Authority. It has accordingly been decided by MPEDA to sanction subsidy and release it only to those farmers possessing the Aquaculture Authority's license.

Notices proposing rejection of applications have accordingly been issued to all new MPEDA farm subsidy applicants who have not produced the license along with the applications. Some of these notices have been returned undelivered by the postal authorities. MPEDA has advised all such applicants that unless they send or personally produce to the MPEDA office in Vijayawada a certified copy of the Aquaculture Authority's License's their application for subsidy assistance will be rejected.

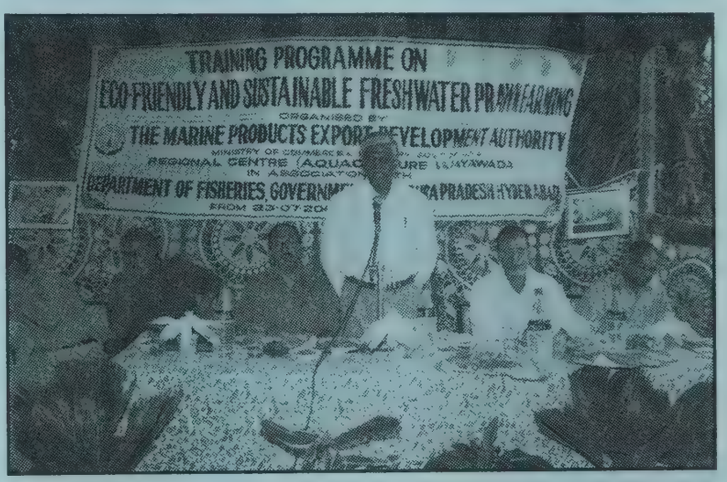
Such persons can, however, apply again for the subsidy after obtaining the Aquaculture Authority's License, latest by 31-12-2001.

Training Programme on "Eco-friendly and Sustainable Freshwater Prawn Farming"

Hyderabad : 23-27 July, 2001

The Marine Products Export Development Authority, in association with Department of Fisheries, Govt. of Andhra Pradesh, Hyderabad, organized a training programme on "eco-friendly and sustainable freshwater prawn farming" from 23/07/2001 to 27/07/2001 at Regional Fish Farm, Hussian Sagar, Hyderabad. The trainees were nominated by the Department of Fisheries, Govt. of Andhra Pradesh from various districts of the Telengana Region of the State. The training programme was conducted to create awareness towards the scampi farming in the Telangana districts where there is a lot of potential.

Mr. R. Ganapathy, Director, MPEDA, Kochi inaugurating the training programme of 23/7/2001 at Hyderabad. Other in the picture are : Messers B. Vishnu Bhat, Dy. Director, MPEDA, V. Suresh, Jn. Director, DOF, M.A. Quadeer, Add. Director of Fisheries, DOF, Govt. of A.P. and M.Mohanaiah, General Manager, NABARD, Hyderabad.


TRAINING PROGRAMME ON
ECO FRIENDLY AND SUSTAINABLE FRESHWATER PRAWN FARMING
ORGANISED BY
THE MARINE PRODUCTS EXPORT DEVELOPMENT AUTHORITY

Mr. R. Ganapathy, Director, MPEDA, Kochi, delivering the inaugural address.

Trainees, farmers, entrepreneurs, fisheries officials and bankers participated in the inaugural function. Mr. B. Vishnu Bhat, Deputy Director, MPEDA, Vijayawada, welcomed the guests. He mentioned that Indian sea food exports for 2000-2001 touched 4.43 lakh mt, of which shrimp alone was 1.13 lakh mt. Considerable quantity of freshwater prawn had been exported from Andhra Pradesh. Around 16,500 ha of area was under scampi culture in the country of which 15,000 ha was in Andhra Pradesh alone. It was also stated 7,500 mt of scampi was exported from the country during the year 2000-2001. He further stated that Telangana region with large water bodies was having good potential for scampi farming. In this context, he requested the entrepreneurs to avail of the existing opportunities. Mr. M.A. Quadeer, Additional Director, Dept. of Fisheries, Andhra Pradesh, in his presidential address, appreciated efforts of MPEDA in promoting scampi farming. Mr. V. Suresh, Joint Director (inland), Dept. of Fisheries, Govt. of Andhra Pradesh stated that Telangana Area was having six lakh ha of water resources of which one lakh ha could be utilized for the production of scampi. The scampi farming in the area would help in the economic upliftment and in employment generation among the people. He requested MPEDA to help the farming community by extending subsidy on inputs related to the activity.

Mr. M.S. Swamy, President, Andhra Pradesh Shrimp Hatcheries Welfare Association, Visakhapatnam, told the participants that quality was very important for exports to the international market and this should be kept in mind. The need was to develop good farming practices. Mr. Venkateswarlu, Managing Partner of M/s. Kakati Aqua (P) Ltd., Hyderabad, requested the governmental agencies to implement Scampi production schemes in the Telangana region since it was having vast potential for scampi farming. Mr. Rangacharyulu, Managing Partner, M/s. Gorwell Formulations (P) Ltd., Hyderabad, narrated how he was guided by MPEDA to take up shrimp culture in Machilipatnam area. He advised the farmers to take up scampi farming which would help in the economic upliftment of the area. Mr. P. Mohanaiah, General Manager, NABARD, Hyderabad, explained about the various financial assistance schemes for aquaculture including scampi farming extended by NABARD as refinance through nationalized and co-operative banks.

Mr. R. Ganapathy, Director, MPEDA, Kochi, inaugurated the training programme. In his inaugural address, he observed that MPEDA was promoting

capture, culture fisheries and market to augment aqua exports. He stated that the India was having four lakh hectares of freshwater area for fish culture, of which only 25,000 ha of area was utilized for scampi farming. He added that scampi farming was more remunerative than agriculture. He exhorted the trainees to take up scampi farming. Mr. Ch. Seshasayana Rao, Regional Director, Zone VI, Hyderabad proposed a vote of thanks.

After the inaugural session, Mr. B. Vishnu Bhat, Deputy Director made a presentation on "Present Status of Scampi Farming and Role of MPEDA". This was followed by a talk by Mr. Ch. Seshasayana Rao, Regional Deputy Director, Hyderabad on "Role of Fisheries Department in the Development of Scampi Farming". Dr. D. Mani Kumar, Field Supervisor explained about "Biology and life cycle of the prawn" to the trainees.

On 24 July, Mr. M. Dandekar, Manager, NABARD, Hyderabad, explained about the role of NABARD in developing aquaculture. Mani Kumar, spoke on water quality management in scampi farming. In the afternoon session, Mr. C. Wilson, Assistant Director (A.E.) explained about the site selection and construction of scampi farm. Mr. P. Brahmeswara Rao, Junior Technical Officer, spoke on "Pond Preparation, Seed Selection and Nursery Rearing Techniques".

On 25 July, Dr. G. Venugopal, Scientist in-charge, CIFE, Kakinada explained about "Hatchery Techniques and Importance of Hatchery Seed in Scampi Farming". Dr. Ashok Nair, Faculty Member, State Bank Institute of Rural Management, Hyderabad, spoke on mode of obtaining financial assistance for scampi farming from Banks. Mr. C. J. Sampath Kumar, Assistant Director (Aqua), MPEDA, explained about the sexual dimorphism in scampi and its importance in its farming. Later, Mr. P. Srinivasulu, Junior Technical Officer spoke on feeding habits of scampi and feed management in scampi farming.

On 26 July, a field trip was arranged for the trainees to the scampi farming areas of Mahaboobnagar, where scampi culture was being carried out by M. Venkat Rao, Y. Seshadri, T. L. Reddy, K. M. Reddy and Satyanarayana at Rangapuram, Biberu and Timapuram villages. The trainees were told about various aspects of scampi farming during the visit.

On 27 July, Mr. Anil Kumar, Junior Technical Officer made a presentation on Prawn Health Management, Harvesting Techniques and Economics of Scampi Farming, followed by a talk on role of APCOB in scampi farming by Mr. Sudharshanam, Deputy Director of Fisheries, APCOB, Hyderabad. A video show on scampi farming was also screened for the benefit of the trainees.

The valedictory function was conducted on 27 July afternoon at which Ch. Seshasayana Rao, advised the trainees to follow the guidelines suggested by MPEDA while carrying out scampi farming. After the valedictory address, he distributed certificates to the successful trainees (21 nos.). Mr. C.J. Sampath Kumar, Assistant Director (Aqua), MPEDA, thanked the State Dept. of Fisheries for extending wholehearted cooperation and also the trainees and others for their support in conducting the training programme successfully.

Shrimp Prices Plummet Further

Following a downswing in exports to Japan, the US and the UK, shrimp prices are stated to have come down further at this time of the year when prices should normally have gone up. Year-end sales could be lower by 30-40 per cent as compared to that of last year, those in the industry observe. According to INFOFISH, US and Japanese markets are dull.

Primarily the slump is due to the economic situation, and has been aggravated by post-September 11 situation in the US, exporters say.

Black tiger shrimp export price to Japan is at an all-time low. Inventories in Japan are stated to be high, 90,000 tonnes compared to normal levels of about 65,000 tonnes.

The only ray of light is Europe which displays a sustained buying interest. The problem in Europe is, however, the ongoing low value of euro that has reduced the purchasing power. The good cold water shrimp fishery in the north sea and the low prices of availability contributed to the depression in the prices.

The price of black tiger, 16/20 counts has dropped to $9.30 per kg, the lowest in the last decade, according to exporters. It is to be hoped that this condition will not last long. Raw material prices have dropped to about Rs.230 per kg, for 30 count on head-on basis. At this level, raw material prices are not viable when compared to the export prices. Freshwater prawn prices have also come down to the disappointment of farmers. The industry is baffled at this, as it is known that there is a demand for the commodity in the US and EU markets. More than 70 per cent of the freshwater prawn produced in Nellore area of A.P. is generally exported to Europe and the rest to the US. Despite a slump in mid-September, exports to the US are stated to be continuing.

Freshwater prawn prices have dropped to about Rs.440 per kg 20 count on head-on basis compared to about Rs.600 during the same period last year, it is stated. Shrimp farmers have curtailed operations because of the slump in prices, it is learnt. According to exporters, the prices have largely been suppressed due to over production and low demand in the export markets.

Prices of capture material (sea tiger) are also seen to be hit following the slump in prices of black tiger and the fishermen have not been able to recover their cost. Fishermen in southern districts of Tamilnadu and in parts of Andhra Pradesh have stopped going out to sea for fishing, unable to sustain losses.

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National Workshop on Mighty Mahseer

(Biodiversity and Genetic Conservation)

Lonavla, Maharashtra : 24 and 25 Aug 2001

A National Workshop on the Biodiversity and Conservation of the Mighty Mahseer was held at Lonavla, a well known tourist spot of Maharashtra, on 24 and 25 of August, 2001. The Tata Power Company Limited (TPCL) which pioneered the work on breeding and conservation of Mahseer in 1970 under the leadership of the renowned fishery scientist late Dr. C.V. Kulkarni, organised the workshop in collaboration with the Central Institute of Fisheries Education (CIFE), Mumbai, National Research Centre on Coldwater Fisheries (NRCCF), Bhimtal, Indian Fisheries Association, Mumbai and Asian Fisheries Society, of Indian Branch, Mangalore. The participating delegates consisted of scientists, administrators, technocrats and representatives of related NGOs from various parts of the country. This was the fourth workshop on Mahseer propagation organised by TPCL; the earlier three were conducted in 1986, 1991 and 1995.

A view of the inaugural session with Dr. K.K. Vass, Director, NRCCF speaking. Seated from L to R are Dr. S.Ayyappan, Dr. K.Gopakumar, Mr. R.S.Aiyyer and Dr. S.A.H. Abidi.

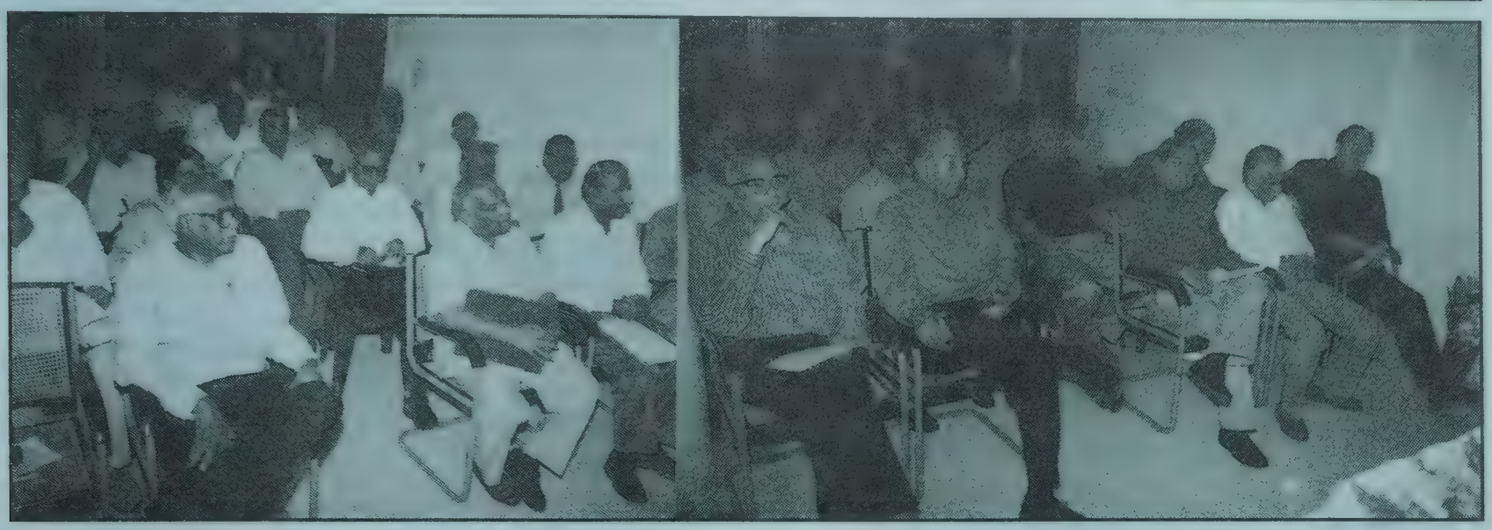
Dr. K.Gopakumar, DDG (Fisheries) displaying the book 'Bibliography of Mahseer in the Indian Subcontinent' after releasing it at the inaugural session.

Dr. P. Keshavanath, Secretary, AFSIB speaking at the inaugural session.

Dr. S.Ayyappan conveying the views of the delegates on the future role of the TPCL in Mahseer propagation to Mr. Ali Engineer, Managing Director of the company.

Inaugural Session

The inaugural session began with the dignitaries paying tributes to late Jamshedji Nauroji Tata, the founder of Tata Group of Companies by garlanding his portrait. Mr. R.S. Aiyyer, General Manager, Tata Power Comapany, inaugurated the workshop. He outlined the objectives of the work carried out on Mahseer propagation at Lonavla and said that the fisheries programme was initiated as a measure of ecological enrichment of the hydel lakes. Dr. S.A.H. Abidi, Member, Agricultural Scientists Recruitment Board (ASRB) and Dr. K. Gopakumar, Deputy Director General (Fisheries) ICAR were the Guests of Honour. In his



Participants.

Dr. S.Ayyappan at the podium outlining the objectives of the brain storming session. Ms. Nita Chowdhury, Joint Secretary (Fisheries), Government of India who chaired the session is seen flanked by Dr. S.N. Dwivedi on the left and Dr. P.V. Dehadrai on the right.

Mr. S.N. Ogale, Manager (Environment), TPCL proudly showing a month-old mahseer fry to the workshop delegates during their visit to the hatchery.

address Dr. Abidi recalled the excellent contribution of Dr. Kulkarni to mahseer propagation. He listed the causes for the decline in mahseer population and called for mass awareness in order to save the endangered fish. Dr. Gopakumar released the 'Bibliography of Mahseer in the Indian Subcontinent' complied by R.K.Langer, S.N. Ogale and S. Ayyappan. He appreciated the vision of Tatas in fostering science by establishing the two famous research Institutes-Tata Institute of Fundamental Research, Mumbai and Indian Institute of Science, Bangalore. He assured the support of ICAR for conservation of the endangered mahseer.

Dr. S.A.H. Abidi, Member, ASRB speaking on the contribution of TPCL to mahseer propagation and conservation.

Mr. Ali Engineer, Managing Director, TPCL, addressing the delegates.

Emphasising the need for studies on Mahseer's gene manipulation and feed, he said these would be helpful in enhancing the pace of its growth. Dr. K.K. Vass, Director, NRCCF called for an action plan for the propagation and conservation of mahseer and Dr. P.Keshavanath, Secretary, Asian Fisheries Society, Indian Branch, highlighted the need to implement such a plan. Earlier, Mr. Vijapurkar, Senior Manager, Tata Power Company welcomed the gathering and Dr. S. Ayyappan, Director, CIFE spoke on the objectives of the workshop. The session ended with a vote of thanks proposed by the Manager (Environment) of TPCL, Mr. Shashank Ogale, who was associated with Mahseer breeding activity at Lonavla since 1970. Later during the day, Mr. Ali Engineer, Managing Director, Tata Power Company, addressed the delegates. Informing that the work initiated by Tatas on mahseer would continue for at least a few more years, he observed that there should be a commercial goal for fisheries research.

Following the inaugural session, two technical sessions were held on 24th August at which 12 papers were presented.

Technical Session I

Dr. S.N. Dwivedi, President, Academy of Scientists, Engineers and Technologies and former Additional Secretary, Government of India presided over Session I. In his opening remarks he observed that mahseer had immense potential that could provide food security to people, especially those in the hilly regions of the country. He opined that a national programme on biodiversity and conservation of mahseer should be drawn up, keeping in mind the various agroclimatic regions of the country. Presenting the first paper, S.N. Ogale covered various aspects of research carried out in Lonavla by TPCL. He narrated the success story of mahseer breeding in 1970 and thereafter. He said that at Lonavla farm, TPCL maintained five species of mahseer and succeeded in repeated breeding of the golden mahseer, *Tor putitora,* and also in hybridising *Tor khudree* and *Tor tor*. In the past 30 years, over 81 lakh nos of fry of mahseer were produced in Lonavla; of these over 11 lakhs were distributed to various States of India for the purpose of ranching and broodstock raising. The hatchery developed by them, being a low cost one, could be a model for any region of the country. He also referred to the imprinting studies conducted for capturing cultured fish. W.S. Lakra, Principal Scientist, CIFE gave an account of biodiversity, genetic conservation and status of mahseer aquaculture. He felt that the efforts made so far are far from adequate and called for use of genetic markers in species delineation and also for development of area-specific hatcheries, low cost artificial feeds and aquaculture practices.

K.K. Vass, in his presentation, dealt with the current status and problems in the development of golden mahseer, *Tor putitora* fishery in the Himalayan uplands. Citing the population size as an indicator of decline, he said a data base had to be created to get the correct picture. He also talked about the need to involve the local population in conservation efforts. S.D. Gupta of CIFA, Bhubaneswar, detailed the raising of *Tor mosal mahanadicus* broodstock in pond culture system and indicated that males and females attained maturity at a weight of 110 g and 224 g respectively. S.N. Chatterjee, former Director of Fisheries, Madhya Pradesh, spoke on the present status of mahseer fishery of Tawa reservoir. He observed that the numerous streams and nallahs joining the reservoir provided alternate routes of migration and offered new breeding grounds. D.S. Krishna Rao of CICFRI's Bangalore centre, presented the eco-status of Mahseer in the rivers and reservoirs of Karnataka. Stating that the picture was sketchy, he felt that a detailed study was warranted to really understand the status to take further steps in the direction of mahseer conservation, since their contribution to fish landings in Karnataka accounted for less than 1%.

Technical Session II

This Session was presided over by Dr. P.V. Dehadrai, former DDG (Fisheries), ICAR. He laid emphasis on the need for field studies and ranching and also on the importance of sanctuaries in Mahseer conservation. A status paper on mahseer (*Tor putitora*) fisheries of Jammu and Kashmir in terms of rehabilitation and breeding of farm reared fish was presented by R.K. Dogra. S.D. Tripathi, former Director of CIFE cautioned against interference with the mahseer stocks of different rivers. He also suggested that physiological studies be taken up on mahseer with a view to augmenting its breeding performance and growth. G.P. Dubey, former Director of Fisheries, Madhya Pradesh shared his 5-decade long experience in Mahseer fishery of Narmada and cited landing percentage as an indicator of decline in population. Prakash Nautiyal of Allahabad University gave a detailed account of exploitation of *Tor putitora* in the Ganga river system, its growth pattern in the Garhwal region and factors governing its migration. Contrary to the earlier presumption that mahseer moved in the direction of cold water, he observed that the fish moved in the direction of cold as well as warm water. Conductivity, dissolved oxygen and light were found to be the major factors that stimulated the onset of migration.

P. Kumaraiah of CIFA's Bangalore centre presented the results of cage studies on mahseer carried out in Hesaragatta reservoir, near Bangalore. He reported a growth of 1.9 g per day in *Tor khudree*. P. Keshavanath of College of Fisheries, Mangalore described the breeding trials carried out employing pond raised mahseer, *Tor khudree* at Harangi in Kodagu district, as a part of the mahseer propagation programme initiated by the Government of Karnataka. The results clearly indicated the positive effect of broodstock diet on maturation and that of temperature on hatching and larval development. The breeding responses of the fish to pituitary extract and to Ovaprim were similar, he said. Further, 70-day cryopreserved spermatozoa were as effective as the fresh ones in fertilizing the eggs, it was added. Dr. B.N. Desai, former Director of NIO, Goa, spoke on the role of fat in mahseer breeding and advised that scientists should keep this in mind while developing artificial diets. He also felt that there was a need for physiological studies related to feeding and breeding. Gorden Rodrigues, Vice President of Maharashtra Anglers' Association, Hemanth Sirur, a free lancer and Hashmi of Gondwana Foundation, Madhya Pradesh expressed their concern about the decline in mahseer population and outlined the action plan they intended to initiate for the rehabilitation of Mahseer for the purpose of sport. At the end of the session, Barucha presented an interesting slide show on nature conservation.

Brain Storming Session

Ms. Nita Chowdhury, Joint Secretary (Fisheries), Government of India, presided over the brain storming session held on 25th August. Dr.S.Ayyappan described the background and the objectives of the session. Dr.S.N.Dwivedi and Dr. P.V. Dehadrai were the lead speakers. 'Where are they (mahseers) gone?' was the theme of the discussion. Should the focus be on sport or culture or on both? What should be done to achieve sustainability? Are the existing laws sufficient to protect the Mahseer? : These were the major issues discussed. It was generally agreed that a broad based strategy be developed for the conservation and management of mahseer and recommended a 5-year time frame to assess the impact of the measures implemented to achieve the goal. Further, the need to upgrade the Lonavla centre to that of a National repository of mahaseer was voiced.

Recommendations

The following recommendations were made at the plenary session.

1. A perspective plan on mahseer fisheries for the next five years be developed.
2. A National Centre on Mahseer Breeding and Conservation be established at Lonavla for maintaining a live gene pool of all mahseer species, with a joint effort of CIFE and The Tata Power Company Limited and providing for a Professor's Chair on mahseer research and conservation.
3. Basic studies on embryology and reproductive physiology of mahseer species be taken up.
4. Mahseer hatcheries be established by the State Fisheries Departments pertaining to specific resources in the respective states for the purpose of stock enhancement.
5. Advanced studies need to be conducted with regard to cryopreservation of milt and development of cell lines of mahseer species as repository of genetic material and for *in vitro* studies.
6. Studies on the genetic structure of mahseer population using molecular markers (DNA fingerprinting, microsatellite, etc) be carried out on priority for species delineation.
7. A comprehensive data bank on species, subspecies and catches of extant Mahseer species be created.
8. It is imperative to carry out a survey on market demand for mahseer in various parts of the country, if mahseer is to be propagated as a new candidate species for aquaculture.
9. The current status of mahseer breeding, nutrition and culture reveals the need for more concerted efforts in standardising its captive maturation and breeding.
10. Studies be carried out on testing of growth promoters, on development of low cost diets, on artificial rearing conditions and on larval development with regard to survival and growth.
11. Important riverine stretches and reservoirs be identified and ranched with seed of suitable Mahseer species with due care to avoid genetic introgression.
12. Further trials on the sustainability of mahseer as a candidate for aquaculture with emphasis on running water aquaculture and cage culture be carried out.

Short Course on Applied Nutrition in Freshwater Aquaculture

Central Institute of Freshwater Aquaculture : December 13-22, 2001

Sponsored by ICAR, Krishi Bhawan, New Delhi

Objective of the Course : To provide exposure to the researchers on the recent developments in aquaculture nutrition, methods used in determining nutrient requirements, feed formulation and feeding strategy that can improve aquaculture production in an ecofriendly and sustainable manner.

The programme included theoretical and practical classes on fish nutrition.

Nominations were invited from Assistant Professors/Scientists and those who are in equivalent positions in Universities/Colleges/SAUs/Fisheries Institutes of ICAR holding atleast master's degree in Fishery Science/Life Science/ Aquaculture/Animal nutrition/Zoology with working experience in Fish and Fisheries Science.

No course fee was charged and the participants were paid sleeper class TA. Accommodation and food were arranged free of cost at the Institute's hostel during their stay for the course.

Indo-UK Workshop on "Need Based Professional Education and HRD in Fisheries"

An Indo-UK Workshop entitled "Need Based Professional Education and Human Resources Development in Fisheries" was organized jointly by the College of Fisheries, Mangalore and Association of British Scholars (ABS), Mangalore Chapter on 30-6-2001 at College of Fisheries, Mangalore. The Workshop was sponsored by the British Council, Chennai.

Dr. A.M. Krishnappa, Vice Chancellor, UAS, Bangalore inaugurating the Indo-UK Workshop. L to R : Dr. H. Shivananda Murthy, Dr. S.L. Shanbhogue, Mrs. Eunice Crook (Director, British Council), Dr. V.Veerabhadraiah, and Dr. D.S.Sheshappa are on the dias.

The Workshop was inaugurated by Dr. A.M. Krishnappa, Vice Chancellor, University of Agricultural Sciences (UAS), Bangalore. Mrs. Eunice Crook, Director, British Council (South India) was the Chief Guest. Dr. V. Veerabhadraiah, Director of Extension, UAS, Bangalore was the guest of honour. Dr. S.L. Shanbhogue, Director of Instruction (F) presided over the function. Dr. D.S. Sheshappa and Dr. H.Shivananda Murthy, coordinators of the Workshop spoke on the occasion.

The Workshop was held in two technical sessions. The first session was chaired by Dr. Veerabhadraiah, Director of Extension and Prof. P.K. Salian, former Director of Instruction (F), College of Fisheries, Mangalore. Lead papers, namely "Facilities required and the curriculum for quality professional Fisheries Education in the Country" and "Role of ICAR in Professional Education and Human Resources Development in Fisheries" were presented by Dr. D.M. Thampy, Dean, College of Fisheries, Cochin and Dr. Anil Agarwal, Principal Scientist, ICAR, New Delhi, respectively.

The second Technical session was chaired by Dr. D.M. Thampy, Dean College of Fisheries, Cochin. Four lead papers were presented. Dr. T.J. Varghese, retired Director of Instruction (F), COF, Mangalore presented a lead paper on "Status of Aquaculture and its man power requirements in the country". Dr. D.S. Sheshappa (Head of Division, Fisheries Science), COF, Mangalore, presented a paper on "Status of Marine Fisheries and Fishing industry and Manpower Requirements". Dr. B.A. Shamasundar, Associate Professor of Fish Processing Technology presented a paper on "Fisheries and Manpower requirements in the Fish Processing industry in India". Mr. S.K. Panda, Students Union President, Deemed University (CIFE), Mumbai, presented a paper on "Need for Creation of Employment Opportunities to Professional Fisheries Graduates". Dr . H. Shivananda Murthy, Workshop Coordinator introduced the speakers and managed the Workshop.

Plenary session was chaired by Dr. S.L. Shanbhogue, Director of Instruction (F), COF, Mangalore. The expert panel included Dr. D.M. Thampy, Dr. T.J. Varghese, Prof. P.K. Salian, Dr. Anil Agarwal, Dr. D.S. Sheshappa and Dr. H. Shivananda Murthy. Few useful recommendations were drawn up for possible implementation by the concerned organizations. Proceedings of the Workshop including papers presented at the workshop will be brought out soon and distributed to all the participants, ICAR and its institutes and other organizations.

Safety Measures for Small Fishermen out at Sea

The participating Governments in BoBP (Srilanka, Bangladesh, Maldives, Indonesia, Thailand, Malaysia and India) at a Workshop on Sea Safety for Artisanal and Small Scale Fishermen, organised by BoBP and FAO, held at Chennai from 8-12 October 2001, resolved to tackle the issue of sea safety of small-scale fishermen on a war footing.

The Workshop resolved that sea safety should be integrated with the fisheries policy and management framework of member countries. This would include associated commitments under the Code of Conduct of Responsible Fisheries and other regional, inter-regional or global instruments and initiatives.

It was also concluded that fisheries and maritime administrations should upgrade their knowledge of the operations of small fishermen in order to formulate effective standards and regulation for the safety of their vessels. The mandatory requirements of safety should be supplemented by other strategies with active participation of the sea going fishermen.

The member-countries were exhorted to initiate education, training and awareness programmes for development of the fisher community, apart from taking up measures for uplift of the fisherfolk along with governmental aid and incentives.

The national representatives strongly voiced the need for formulation of a regional sea safety programme with a consultative and participatory approach based on institutional data and operational experience of artisanal and small scale fishermen.

Advances in Satellite Technology *vis-A-vis* Aquaculture

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Advances in telecommunications have structured the world into an integrated global configuration in respect of human contacts. The global telecommunications network enables us to access, collect, process and deliver information from one location to almost anywhere in the world. Distance is no longer a problem. A computer, a modem and a telephone make it possible to access any can see and hear about world events instantly. This capability of exchange of information on a global basis has been made possible through satellite, a powerful communication tool, which now has an increasingly important role in the global information infrastructure.

Communication satellites have ability to broadcast script through television, radio (video, voice) or data over the entire coverage area of the satellite which can be as large as one-third of the world with bandwidth on demand and to provide reliable communication connecting any pair of points in the coverage area with costs independent of distance. Satellite technology eliminates distance barriers, offers accelerated extension of coverage, with quality transmission of mu'ti service offerings and international reach.

Role of Satellite Communication

1) Promote economic growth and accelerate national development;

2) Modernize and integrate society;

3) Improve national efficiency and productivity by timely availability of information and speed of response to demands;

4) Enhance equitable distribution of development;

5) Conserve energy;

6) Improve speed of decision-making;

7) Eliminate isolation of remote areas;

8) Expand market opportunities; and

9) Attract capital flows for information development.

Advances in Satellite Technology

Satellite communication technologies have been geared by a number of technology and productivity improvements because of rapid growth in demand. These advances dramatically increased the power, capabilities and cost effectiveness of satellite communication both in space and on the ground. With continued improvement in satellite communication technologies, there has been acceleration in the rate of new satellite applications.

Some common tools using satellite communication

VSAT: VSAT is an acronym of very small operation terminal and refers to 'receive/transmit' terminals installed at geographically dispersed locations connected to a central hub *via* satellite using small diameter antenna dishes. This technology uses a cost-effective solution for users seeking an independent communications network connecting a large number of geographically dispersed sites. VSAT networks offer value-added satellite based services capable of supporting Internet, data, LAN voice/Fax communications.

The main advantages of VSAT communication over cable are a VSAT connection cost does not depend on distance and cost per connection comes down considerably when more of new users are added.

The VSAT system can be utilized in following ways:

a) Interactive computer transaction; b) Internet; c) Video teleconferencing; d) Database enquiries; e) Voice communication; f) E-mail; g) Sales monitoring & stock control, and h) Distributed remote process control and telemetry.

VSAT network comes in various shapes and sizes ranging from point to point, point to multi-point, and on demand for those and of sites based on a dedicated facility located at their own site.

GPS: GPS is an acronym for Global Positioning System. This equipment is a hand-held satellite navigation system and uses the satellites in space to find the position any where on the earth.

Thus this system is a constellation of satellites that orbit the earth twice a day, transmitting precise time and positioning information to anywhere in the globe, 24 hours a day. The GPS constellation consists of 24 satellites orbiting the earth in six fixed planes that are inclined at 60° from the equator. Each satellite is 11,000 nautical miles above the earth and orbits the earth twice a day.

This system was initially developed and deployed by the U.S. Department of Defence, primarily to provide entire worldwide positioning and navigation data to US and allied military forces around the globe. GPS has got enormous use in civilian and commercial applications ranging from navigation and surveying to exploitation and tracking.

Some common applications of GPS in aquaculture are:

a) Finding the aquaculture potential and threat sites in streams and locating these points on map;

b) Measuring atmospheric parameters affecting the aquatic habitat and living.

c) Finding the meandering nature of

streams and assess the potential of arrangement of aquatic living.

d) Finding the relative distance among threatened, exploited and potential sites and locating these features on map for path analysis.

GIS (Geographic Information System): It is an information system which orginated in mid - 1960 and designed to work with data referenced by spatial coordinates. In other words, GIS is a database system with specific capabilities for spatially referenced data as well as a set of operation details for working with data. Thus geographic information systems are a means of integrating spatial data acquired at different scales, times, and different formats for deriving useful information in map form for better understanding, analysis, and planning for organised development.

The common sources normally used to provide spatial data for GIS work are Remote Sensing, Global Positioning System, Field Survey, Toposheets etc.

The scientists, resource managers, urban planners and others basically use Geographic Information System in several main areas. Such a system is used primarily for following four operations.

a) To measure environment parameters; b) To develop maps that portray characteristics of earth; c) To monitor changing in space and time; and d) To model alternatives of actions and process operating in the environment.

The applications of GIS in the field of fisheries are :

a) Study of land use pattern including mangrove and forest cover of a particular area;

b) Identification of suitable area for aquafarming and recommending dosages of different inputs for aqua farming;

c) Assessing the proximity of aqua farm sites to market, processing plants etc.,

d) Coastal Zone Management and village level planning;

e) Identification of optimum area for intertidal molluscan culture, extensive shrimp, fish culture in salt ponds;

f) Determining the best location for siting of sea cages;

g) Explaining circulatory dynamics in estuarine environment; and

h) Mapping changing patterns of turbidity.

Remote Sensing: Remote Sensing is the science and art of collecting data by technical means on an object on or near the earth surface and interpreting the same to provide useful information. It is a technique of observation which has progressed from simple process of viewing the landscape from a hill top to the complex process of gathering data and imaging satellites and processing the same through visual or computer analysis and presenting the information in the form of maps or graph or statistics. The utility value of RS technique to fisheries and aquauclture is enumerated as follows.

a) Location and enumeration of water bodies and maintaining their up to date inventory,

b) Calculation of dimension of river and lakes,

c) Study of geomorphology and productivity of water bodies through measurement of eutrophication, sediment load,

d) Study of ocean currents, freshwater flow into seas, and offshore upwelling of ground water,

e) Indicating sea surface temperature gradients for identification of potential fishing sources in seas and oceans, and

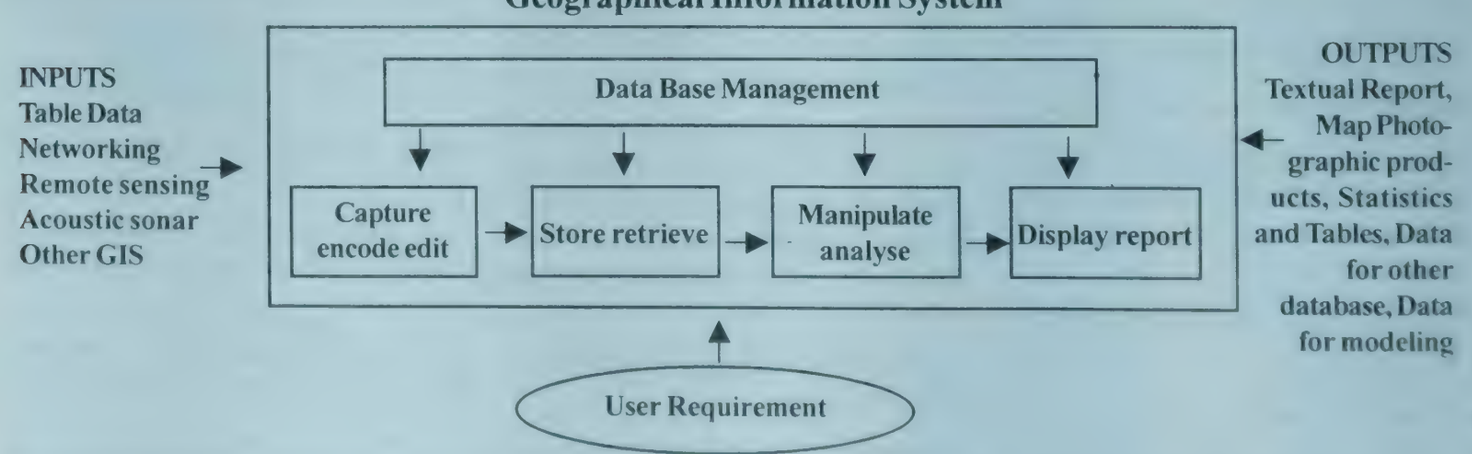
f) Mapping surface water, seasonal variations and extent of floods.

In contrast to other disciplines, remote sensing application to fisheries and aquaculture developed quite late. This is largely because it is much easier to develop sensors to make terrestrial observations than aquatic ones. The other reason is the rather short time scale for information to be relevant to aquaculture, as compared with other uses. For example, water quality and flow rate changes constantly in coastal and estuarine tidal areas, water quality may change seasonally as a function of agricultural activities and rainfall, whereas, in respect of a forest, inventory is carried out biannually, which may be sufficient to detect change.

Achievement of Indian Satellites

The launch of OCEANSAT-I, indigenously built by ISRO on 26 May 1999 is

Geographical Information System



a milestone in the history of Indian Space Programme. This satellite weighing about 1,050 kg is a sun synchronous satellite orbiting at an altitude of 720 km. It has been fitted with two sensors having a wide swath of about 1500 km and would be able to cover the entire globe within two days. The multi-channel microwave radiation is at four frequencies in both horizontal and vertical polarization. These are called microwave frequencies and it has the advantage of giving information even in the presence of most of the clouds, which is typical to tropical countries. A particular combination of channels is used for geophysical parameter retrievals. Multi Frequency Scanning Microwave Radiometer (MSMR), started on 28 May 1999 gives information about sea surface temperature, sea surface wind speed, atmospheric water vapour content and liquid water content etc.

The second instrument is Ocean Colour Monitor (OCM) which measures reflected solar radiation from ocean surface in different colours influenced by chlorophyll, suspended sediments and yellow substances. It would also give a spin off, the atmospheric aerosols and water vapour, two important parameters needed for global change research. The OCM bands are carefully chosen to provide this information about ocean constituents and atmospheric correction. Phytoplankton supports almost all-marine life and serves as a biological pump in the ocean and acts as a sink for atmospheric Co_2.

OCM has many applications, scientific and operational :

i) Phytoplankton's spatial and temporal distribution,

ii) Detection of algal blooms and their dynamism,

iii) Identification of potential fishing zones, upwelling and other high productivity region,

iv) Delineation of ocean currents and eddies,

v) Observation of pollution and sediment inputs to the coastal zone and their impact on marine food,

vi) Sediment dynamics,

vii) Dynamics of the estuary/tidal inlets,

viii) Shoreline changes, and

ix) Coastal circulation and dispersion patterns.

The two data from the two devices together will enhance the fisheries forecast scenario and certain value added data, such as humidity profile and oceal flux, required as inputs to Numerical Weather Prediction, will also be available. Used in conjunction with INSAT and other data obtained through global telecommunications services, it would certainly boost the oceanography, weather research and aquaculture production in India.

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J C Markanday bags Swami Sahajanand Saraswati Award (1999-2000)

The Swami Sahajanand Saraswati Extension Scientist/Worker Award of ICAR for the biennium 1999-2000 has been conferred on Dr. J.C. Markanday, officiating Head, TTC/KVK, NDRI, Karnal for his outstanding contribution in developing innovative extension methodology in the field of fish farming and fish breeding.

Dr. Markanday has been able to popularise fish farming in non-traditional areas by developing innovative extension methodology by which he was able to convince Panchayats to lease out their community ponds for fish farming. The technology of induced breeding of Indian major carp was simplified so that even fishermen and farmers can produce fish seed. Dr. Markanday has developed and organized various training programmes which have generated interest among the farmers and rural youth to adopt fish farming and fish breeding as a vocation. This vocation is in high demand among the farmers of Karnal district as well as in other states of the country. Another important contribution of Dr. Markanday is removal of aquatic weeds through bioagents, which is being practised by many organizations.

Dr. J.C. Markanday receiving from Mr. Nitish Kumar, the then Union Minister for Agriculture, the Swami Sahajanand Saraswati Extension Scientist/Worker Award of ICAR (1999-2000)

Extension of Indian maritime zone sought

It is reported that India will shortly apply for extending its Exclusive Economic Zone from the present 200 nautical miles from the coast to about 350 nautical miles. This would mean seeking extension of its EEZ from the present 2.1 million sq kms to about three million sq km, almost the size of its land mass.

Read Fishing Chimes Your Desktop companion

Bar-coding System: Concept and Applications in Seafood Industry

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Managing a business today is a challenging job. Consumers around the globe are becoming increasingly quality conscious. Growing consumer demand for better services, and quality and variety in the face of increased global competition have prompted companies to embark on reformed strategies of managing business. Supply chain management has become a strategic initiative for companies that are committed to improving service and reducing cost in relation to Efficient Consumer Response (ECR) activities. In this context, Bar-coding has emerged as a suitable tool. It has also become an important requirement in order to conform to the stringent food safety standards prescribed by the developed countries. Seafood exporters all over the world now use Bar-coding extensively in view of its wide applications and benefits to the industry.

What is Bar-coding ?: A Bar-code is a special graphical image that uses alternating dark and light color bars of different widths to encode numbers, letters, marks, punctuations or other special characters. A bar-code contains two primary parts: 1) the bars and spaces, and 2) decipher-readable text which people can read to tell what the bars and spaces are saying to the scanner.

History of Bar-coding: Albert Heijn, a Dutch retailer and a few other manufacturers and distributors, having realized the need for having a standardized form of product codification, set up the European Article Numbering in 1977. EAN was officially registered with Albert Heijn as its Chairman and started operations with Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland and the United Kingdom as founding members.

The EAN system almost immediately expanded beyond Europe, and Japan adopted the EAN system in 1978. The United States of America implemented this system in a different name as UPC (Universal Product Code), governed by an organization called UCC (Uniform Code Council, Inc.,)

Countries all over the world started joining in EAN international located in Belgium and India affiliated itself to it during the year 1995. The bar-coding system in India is governed by EAN - India.

EAN - INDIA: EAN - India as an organisation was promoted by the Ministry of Commerce, Government of India and was registered in June 1996 as a non-profit society, and as a joint initiative with the industry. The apex chambers of commerce and trade associations such as CII, FICCI, Spices Board, BIS, ASSOCHAM, FIEO, APEDA etc., are represented in the Governing Council of EAN-INDIA. It is the only authorized body for allocation of EAN, UPC numbers to the Indian industry to be used globally in bar-coding.

BAR-CODING

Types of Bar-coding: The bar-coding may be basically classified into two, based on 1) area of application, and 2) size of bar-coding.

In relation to area of application, it may be divided into three types: a) *Bar coding reserved for internal company use*: This is to identify anything in a closed system i.e., within a single enterprise and not for supply chain use. For example, individual companies may have a need to bar-code information that is unique to their business, but it does not need to be communicated throughout the supply chain; b) *Bar-coding reserved for mutually agreed trade partners*: This type of bar-coding is used to exchange information between two mutually agreed trading partners, but not for supply chain use; and c) *Bar-coding used in supply chain*: This type is used in open supply chain system.

Based on size, six primary bar-codes are used by the UCC/EAN today. They are UPC-A, UPC-E, EAN-13, EAN-8, ITF-14, and EAN - 128. Two more "supplemental" bar codes are used in combination with primary product identification symbol on books, magazines, periodicals, and greeting cards. The following provides a graphic picture of each type :

Colour of Bar-coding: Contrast between the bars and the background of a bar code symbol, are vital to the reading ability of the bar-code scanner. Black bars on a white background provide the ideal contrast. However, to allow for greater label/package design latitude, colours can be incorporated but they need to be carefully chosen. Dark colours should be used for the bars with light colours for the background. It is advisable to discuss any proposed colour combination with the printer. Care must be taken when using red colour, as a bar-code scanner will not recognize red. Consequently, red must not be used for bars. Also brown or bridle colour need to be used with caution. If they contain too much red the bars will not be recognized by the scanner. Red is perfectly acceptable as a background colour.

Recommended Colour Combinations: Bar of black, blue, green or dark brown on a background of white, yellow, orange or red is recommended.

However, while other combinations can be used, they would require careful checking prior to committing a print run. If the combinations do not result in adequate contrast the bar code can fail at point of sale.

Size of Bar-coding: The bars not only require contrast but they also need to be accurate. The final printed thickness of the bars and the spaces between them are critical. Various elements in the production of the final printed symbol can affect the accuracy of the bars, which in turn reduce a scanner's ability to read the bar-code.

With the exception of the ultra modern ones, most printing machines suffer from ink spread or gain during the printing process. As a result, the printed bar code ends up slightly larger than specification. The bars get too wide and the spaces become too narrow. A scanner will not be able to read them.

To help overcome bar-code failures, the codes can be enlarged to facilitate printing accuracy. As the amount of ink spread depends on the machine and the packaging / label material, it will be the best approach to determine the size of the bar-code to be used after a discussion with the printer. By using printability gauges, the printer will be able to determine the amount of ink spread that can take place in the printing process and recommend a bar-code size, compatible with the printing machine used.

In preparation for printing, the bar code is first printed as a film master. This must be produced to an accuracy of $\pm$ 5 microns and have the bar widths reduced to suit the printer's printability range (BWR - Bar Width Reduction). They can be ordered in a size to suit the printer's specifications but must not be enlarged or reduced through a camera lens as the bars will become distorted.

Printing of Bar-code on Packaging Material: Most UCC/EAN bar-codes are printed by one of the following:

* Printing companies that use -

- traditional printing methods (eg. Offset, flexographic, gravure or screen) or

- digital printing methods (eg. Bar-code digital offset, in line ink-jet, or in line ion deposition)

* Digital bar code printing equipment (eg. Direct thermal, thermal transfer, continuous feed laser, or industrial ink-jet.

* General purpose printing devices (eg. Sheet feed - laser or ink-jet)

UCC/EAN bar-codes are usually printed directly on :

* Black labels used for imprinting

* Labels with complex graphics

* Hang-tags for coils of steel or paper

* Apparel tags

* Consumer packaging (eg., Bread bags, magazine covers)

* Standardized, corrugated containers (eg., Standard cases with fixed quantity or assortment of consumer packages).

Bar-code printing methods vary depending on the item being bar-coded. No matter what printing method fits the requirement, one could produce the barcodes; however if the barcode's data varies (eg., requires a lot, batch, date code) the company may print their own. Retailers may also use traditional printing methods for in-store coupons or they may have electronic printers that produce coupons for the customer as a part of the Point Of Sale process (POS: The point where a customer purchases a product within a retail store. This purchase is typically facilitated by a check out lane or counter where bar-code scanning equipment is located).

Equipment required for Bar-coding: *Computer*: A software package for designing bar codes; *Printer*: To print the bar-codes on the product package; *Verifier*: A device that tests the accuracy of the bar-code to determine if the bar-code meets the specifications; and *Scanner*: An electronic device used to read bar-codes and convert them into identification numbers understandable by a computer system.

Formalities in adopting Bar-coding System: As a first step forward bar-coding the processor/exporter needs to apply for EAN number to enable universal identification of their products for world wide use with barcode printed / labeled on the product package. However, exporters exporting exclusively to USA and Canada need to use only a UPC number which will be allocated through EAN - India. This same UPC number will be valid for exports to European countries as well. In case an exporter wants to export to countries other than USA and Canada, they need to use only an EAN code. The one time registration fee is Rs. 20,000/- and the annual fees is Rs.3000/-.

After getting the allocation of the company code (which is generally a six digit number) the processor/exporter should develop his own product code number for each of his items, keeping the expectations of the retailer, consumer in mind. Usually the product code will be in five-digit number. From the company and product code, the check digit can be computed. The computation procedure involves six steps which are explained by the following example.

Step 1) Suppose we want to find the Check Digit for the UCC-12 (UPC) Number 61414121022. Set up a table with twelve columns and put the number i.e., 61414121022 into Positions Twelve through Two. Position One will be blank because it is reserved for the check digit.

Step 2) Add the number in Positions Twelve, Ten, Eight, Six, Four and Two : (6 + 4 + 4 + 2 + 0 + 2 = 18)

Step 3) Multiply the result of step two by three : (18 x 3 = 54)

Step 4) Add the numbers in position Eleven, Nine, Seven, Five, and Three : (1 + 1 + 1 + 1 + 2 = 6)

Step 5) Add the results of Step Three and Step Four : (54 + 6 = 60)

Step 6) The Check Digit is the smallest number needed to round the result of Step Five up to a multiple of Ten.

In this example the Check Digit is 0.

Use of Bar-coding

1. Facilitates compliance with product traceability requirements of EIC/ MPEDA / EU.

2. Facilitates product recall.

3. Enables adherence to stringent quality and hygiene norms.
4. Streamlines work processes of exporters in unused goods inventory management, work in progress, etc.
5. Enables higher export price realization through bar coding of products at exporter's end, instead of buyer's end.
6. Enhances product acceptance by overseas buyers.
7. Helps promote Indian value-added products worldwide.
8. Keeps Indian exporters technologically abreast of international best practices.
9. Facilitates consignment tracking in supply chain including Ports/ Customs.
10. Enables compliance with national IT Task Force mandate of bar-coding, and
11. Enables automatic data capture and the electronic transmission of product information through EDI.

Disadvantages of Bar-coding

* Seafood packaging master carton's brown colour does not provide a lot of contrast with the dark colour of printed bars.
* Special care is required for printing UCC/ EAN - 128 and EAN / UPC symbols.

Conclusion

In India bar-coding has not been adopted by majority of enterprises in the seafood industry. Since bar-coding is on its way to becoming almost a compulsory requirement in the advanced markets, it is imperative that the system is introduced at the earliest. The Government of India amended the Exim Policy bill, and for the first time bar-coding is introduced in the Bill. In Chapter 14 (para 14.9 & 14.10) of the bill bar-coding for export of retail product and product at carton / consignment level has been made compulsory for certain sectors including seafood products with effect from a date to be notified by the DFGT. There is a possibility that the non-use of bar-codes might become a non-tariff barrier in future and to avoid such eventuality the seafood industry has to adopt bar-coding system at the earliest.

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Projet for collecting Oceans' physical data is under way

An ambitious project for collecting data on temperature, salinity and velocity of currents in the world's oceans, 1,000 to 2,000 metres deep, is under way with endorsement from the Inter-governmental Oceanographic Commission (IOC) of the UNESCO and the World Meteorologocal Organisation (WMO).

Known as the ARGO programme, it consists of 3,000 free floating sensors spread over the various oceans, which will record data on these three variables and transmit them in 'quasi-realtime'. The data will be freely available to anyone who requires it, with no period of exclusive use, on the Global Telecommunications System within 24 hours of its collection.

A two-day Indian Ocean ARGO Implementation Planning meeting was held on 26 and 27 July, attended by 65 delegates from 22 countries. Organised jointly by the IOC, the WMO, the National Oceanographic and Atmospheric Administration (NOAA) of U.S., and the Department of Oean Development (DOD), Government of India, it has Prof. Dean Roemmich, Chairman, International ARGO science team, Dr. Harsh K. Gupta, Secretary, DOD, Dr.R.R.Kelkar, Director General, Indian Meteorological Department, Dr.Stanley Wilson, Director International Ocean Programme, NOAA, and Dr.K.Radhakrishnan, Director, Indian National Centre for Ocean Information Services (INCOIS), among its prominant participants.

In his keynote address, Prof. Roemmich is reported to have said these floats would provide more than one lakh individual profiles of temperature, salinity and velocity which will enable oceanographers and meteorologists to gain knowledge of the only area which is at present out of bounds for them — the sub-surface conditions. The ARGO programme would be a major contributor to the ongoing Climate Variability and Predictability Programme.

Oeans are, by far, the biggest reservoir of global heat and water. These two, in combination with each other and other factors, determine climatic features like evaporation, ocean currents, precipitation, wind and cyclones. They also influence fishing and other sea-based occupations and have indirect influence on a host of other human activities. With satellite data available for practically the entire ocean and land surface and the atmosphere, scientists hope that seasonal and inter-annual climatic predictions will become more dependable. This data will also enable better ecosystem modelling and forecasting of monsoons and cyclones. India is one of the 14 countries contributing scientists to the ARGO scientific team and has agreed to deploy 150 of the 450 floats planned for the Indian Ocean between 2001 and 2005.

Each float, costing US$15,000 and with a life of four years, is at present available only from three companies. India plans to acquire the tehnology for their production and has planned centres for the reception and dissemination of data. INCOIS, based in Hyderabad, is responsible for implementation of the national programme, it is stated.

A.P. Govt's Best Exporter Award, 1999-2000

(Leather, Animal and Marine Products Group)

The Best Exporter Award Certificate of the Government of Andhra Pradesh, Commissionerate of Industries under the above mentioned group, was conferred on M/s. Nekkanti Sea Foods Limited, Visakhapatnam for the year 1999-2000. Mr. N. Chandrababu Naidu, Chief Minister of Andhra Pradesh presented the Certificate and the accompanying memento on November 2, 2001 at an impressive function held in Hyderabad. Mr. N.S.R. Murty, Managing Director and Mr. A. Subba Rao, Chairman of the company received them.

Dr. Devadasan, Director, CIFT, Cochin receiving Sardar Patel outstanding ICAR Award for 2000 conferred on CIFT, from Mr. Nitish Kumar, the then Union Minister for Agriculture at a function held in New Delhi on July 16, 2001.

Model Marine Plywood Boat for A.P Fishermen Launched by Kerala Fisheries Minister : Veli, Trivandrum: 3 Oct 2001

Trivandrum-based Fishermen's Co-op Federation's Pioneering Achievement

South Indian Federation of Fishermen's Societies (SIFFS), a leading non-governmental organisation with headquarters in Trivandrum, has developed a new marine plywood craft as substitute for the traditional 'Teppa' (kattumaram) used by fishermen of northern Andhra Pradesh, at its Boat Building, Research and Development Centre located at Veli, Trivandrum. This new boat was launched at the place by Prof. K.V. Thomas, Kerala Minister for Fisheries, on 3rd October 2001.

For the last many years the fishermen of northern Andhra, especially of Srikakulam District, have been finding it difficult to obtain soft woods suitable for their kattumaram, locally called 'teppas'. As an interim measure they started building small boats made of planks of hard wood and filled up with thermocol. This crude craft is not durable as it requires regular replacement. ARTIC, a leading NGO was financing this craft as part of the cyclone relief project it was conducting in the aftermath of the super cyclone that hit Orissa and northern Andhra coast in 1999. Finding the local craft very crude and non-durable, ARTIC itself conducted experiments in craft improvement using marine plywood instead of wooden planks. As they lacked boat building experience, these experiments were not very successful. Learning that SIFFS, which has an office in Kakinada, has considerable experience in designing and building marine plywood boats, ARTIC approached SIFFS. SIFFS got involved in the experiment to provide Srikakulam fishermen with a better alternative. This resulted in the development of a new plywood 'Teppa' at the R&D centre of SIFFS at Veli in Trivandrum.

In order that the new design can be improved upon as well as produced locally, SIFFS has trained local carpenters from Srikakulam in boat building. The new model at Veli has been built involving the Andhra carpenters and the first plywood 'Teppa' was officially launched on 3rd October 2001 by Prof. K.V. Thomas, Minister for Fisheries and Tourism, Govt. of Kerala. It was received by representatives of ARTIC at a function held at the SIFFS R&D Centre, Veli. ARTIC as well as some of the Srikakulam fishermen who have seen the boat under production have expressed a great hope about its suitability for the northern Andhra Coast. The new craft which is meant for both rowing and sailing is expected to cost around Rs.24,000 each. Though it is more expensive than the local craft which costs around Rs.12,000, the longer life and better performance of the new craft is expected to make it attractive for the fishermen of Andhra.

The South Indian Federation of Fishermen Societies (SIFFS) is the apex body of over 100 village-level fishermen's societies spread out in the coastal villages of Tamil Nadu, Kerala, Pondicherry and Andhra Pradesh. These societies are organized into district or area-level federations, which are affiliated with SIFFS. Different activities are undertaken by the village, district, and apex level organisations. The village level organization concentrates on local fish marketing, savings and credit. The district level organization provides various services to the village societies to ensure their proper functioning.

SIFFS as an apex body has a diversified portfolio of activities. Some activities are general and are meant to serve artisanal fishermen all over South India. These include R&D, boat building, supply of motors and its servicing, credit, information dissemination, studies and supply of ice etc.

Boat building is one of the prime activities of SIFFS since its establishment. As the availability of suitable timber for country crafts became more crucial in the artisanal fisheries sector, SIFFS tried out other alternatives to their country crafts which resulted in the grand success of marine plywood boats. A Non-governmental organisation, which is always in the forefront of developing new technologies for the upliftment of artisanal fishermen, SIFFS has the credit of being the pioneers of marine plywood boats in the South, especially in Kerala and Tamil Nadu. SIFFS has a full-fledged research & training centre at Veli for developing new technologies, especially for marine plywood and fibreglass boats.

Hon'ble Minister for Fisheries & Tourism, Kerala presided over the Meet.

The launched Marine Plywood Boat

Pelagic Fishing using FAD in Thailand

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The most important fishing method in terms of the quantity of fish being landed in India is trawling. Trawling takes away a good share of the profit towards running expenditure. More over, lot of time and fuel gets wasted for the reason that in most of the cases the nature and distribution of the target fish is unknown. Every year a large number of new trawlers are being introduced into the fleet and as a result the catch per effort is declining steadily which can be again correlated to the over-exploitatiion of the demersal fishery resources. Urgent attention has to be therefore given for the diversification of fishing methods and greater emphasis needs to be given for pelagic fishing. To make the operations more viable, new technologies like FADs, (Fish Aggregating Devices) can be adopted.

The aggregation of fish around floating, submerged or drifting objects is a well known phenomenon and the fishermen have all along been taking advantage of this behaviour of the fish. Various types of FADs are being constructed by the fishermen throughout the world and are being successfully used for fishing. They can be floating, midwater or submerged depending on the target species. Old tyres, net materials, branches of trees etc., are the materials commonly used for the construction of a FAD. The association of fish schools around a FAD may last for months either continuously or after a specific interval they may appear and again disappear. All kinds of tunas, bonitos, pilot fish, rainbow runners and sharks are the commercially important fishes known to be attracted to FAD.

Tuna purse seining operations were conducted from the Departmental Fisheries Training and Research Vessel, M.V.SEAFDEC, 65.02m LOA, of South East Asian Fisheries Development Centre in Indian Ocean using FAD, locally known as "Payaw'. The simplest type of FAD in Thailand is nothing but a floating raft made of 6-8 bamboo poles lashed together and allowed to drift in water using floats. Old fishing nets of 7-8m length are hung from the raft. A radio buoy is attached to each FAD to know the location of the same. Details of a typical FAD used by SEAFDEC, Thailand, is shown in Fig.1. There are about 30 numbers of FADs belonging to the SEAFDEC which are allowed to drift in the Indian Ocean. The radio buoy fixed to the FAD has to be activated to know the location of the FAD. Only the mother ship has the code to activate the required FAD. Thus access is denied to the FADs by other commercial fishing vessels.

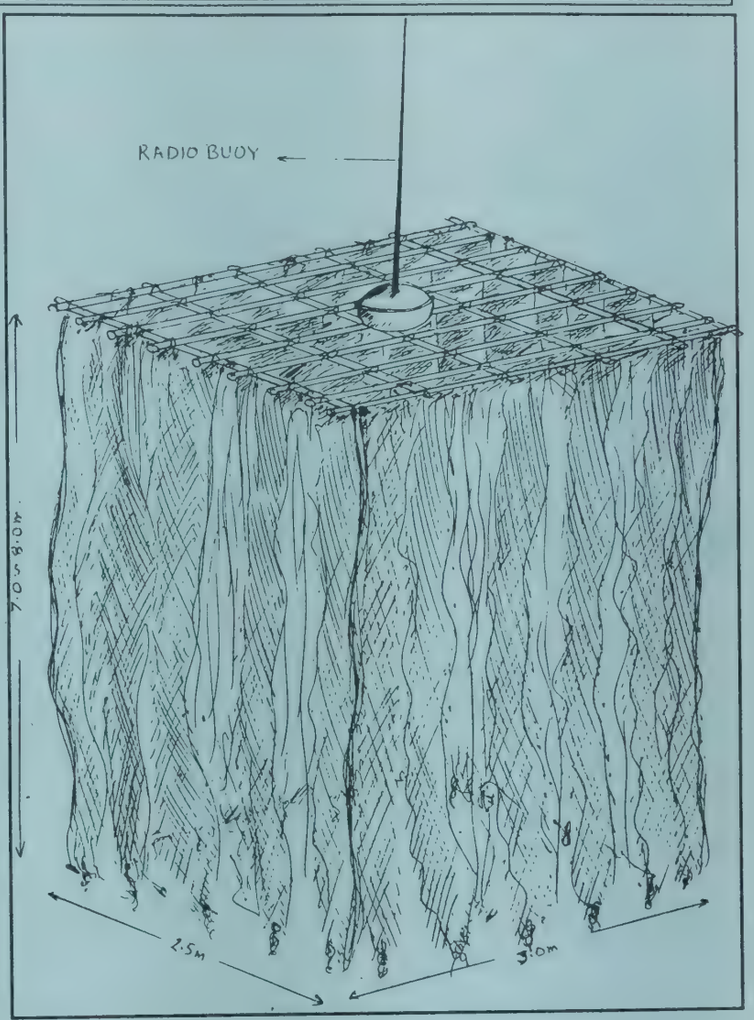

Fig:1 FAD used Typical 'SEAFDEC'

The purse seine net operated on board M.V.SEAFDEC is 1500m long, 150m deep, made of nylon twine with a bunt on one end.

Fishing operation

On reaching the fishing ground, the vessel starts searching for the FAD. Once it is located the vessel sails towards it and the scanning sonar is activated to quantify the fish school around the *payaw*. If the fish aggregation is less, then fishing operation is skipped and the vessel searches for another FAD. Usually the vessel approaches the *payaw* during night and keep about one km away till next morning because the fish aggregation is usually observed during early morning and after dusk. Immediately after locating a large fish school around the FAD a skiff is sent with an underwater light towards the FAD and it remains close to the FAD till next morning to attract and keep the fish close to the FAD. Wind and current direction are the most important factors influencing FAD fishing operation. With the help of Dopler current meter the current pattern at 10m, 50m and 100m depths are

Table.1			
No.	*Fish catch*	*Weight(Kg)*	*%*
1.	Skipjack tuna	75.640	75.6
2.	Bigeye tuna	10.680	10.7
3.	Yellowfin tuna	13.680	13.7

verified. If the currents are not favourable the fishing operation is skipped and the vessel moves to the next FAD. Shooting of the net begins usually at 6 am and completed within 5 to 10 minutes.

Catch details

During March 1996 three purse seine operations were carried out on board M.V.SEAFDEC and more than 100 tonnes of tunas were landed and during March 1998 two purse seine operations were carried out and the total catch estimated was more than 100 tonnes. The details of the catch are given in Table 1. As the vessel's storage capacity is only 100 tonnes,the rest of the catch was discarded in the sea. Skipjack tuna comprised 75.6% of the catch and the rest was Yellowfin and Bigeye tuna. Sharks, Marlin and Rainbow runners were also landed in negligible quantities.

The catch indicates that purse seining using FAD is very much economical. Apart from saving of time and fuel, the landings of low value fishes and juveniles of commercially important fishes can be minimised considerably.

In India the technology of FAD is yet to be adopted by commercial fishermen. It can be adopted as a part of our deep sea fishing effort. By adopting this strategy the fishing pressure and the associated conflicts in the coastal areas can be reduced. Various Governmental and associated research agencies should come forward, in all maritime states, to demonstrate the construction and operation of FAD in India.

Acknowledgement

The authors wish to thank the Department of Agricultural Research and Education (Ministry of Agriculture), New Delhi, Dr.K.Gopakumar, DDG (Fisheries) ICAR, Dr. Ravindran, the then Director, CIFT, Cochin, and SEAFDEC for giving opportunity to participate in the training course in Pelagic Fishing at SEAFDEC, Thailand during 1996 and 1998 respectively. Thanks are also due to Mr.K.K.Solanki, Scientist-in-Charge, VRC of CIFT for the encouragement.

Demand for withdrawal of ban on fishing for sharks and others.

Cutting across party lines, members from southern states in the Lok Sabha today made in forceful plea for withdrawal of a notification banning fishing of sharks and 60 other fishes saying lakhs of fishermen have been badly hit by the order.

Raising the issue during the zero hour, MDMK leader Vaiko termed the ban as 'arbitrary and unjust' and said livelihood of fishermen from Tamilnadu, Kerala and Andhra Pradesh has been affected by the notification.

He was immediately joined in his contention by members from the DMK, AIADMK, Congress and CPM.

CPM member P.Mohan said the decision to allow foreign trawlers to fish in Indian waters was adding to the woes of the fishing community.

Responding to the concern, Paliamentary Affairs Minister Pramod Mahajan said he would bring the issue to the notice of the Environment Ministery and added that the matter had assumed greater importance as even the Deputy Speaker had given his views.

Kerala opposes ban on Certain Fishes

Terming the ban on catching shark and certain other varieties of fish as impractical, Kerala has strongly urged the Centre to reconsider the decision that would badly affect the State.

During question hour, the Fisheries Minister, Mr. K.V.Thomas, told the State Assembly that the matter had already been brought to the notice of the Prime Minister, Mr. A.B. Vajpayee.

Officials who did not have even basic knowledge of the subject had suggested the ban on 60 marine products, he alleged.

Kerala, which exports several crores of rupees worth processed marine products annually, would be the worst affected by the Centre's decision, he said, adding that the State government was formulating a policy on the fisheries sector.

World Fisheries Day observed by A.P Fishermen

Several fishermen's organisations took out a massive rally at Visakhapatnam from the Fishing Harbour to Collectorate here on 21st November on the occasion of World Fisheries Day, raising slogans for an early solution to their long-pending demands. The rally culminated in a dharna.

The Trawler's Worker's Welfare Association, National Fish Workers Forum and Non-Mechanised Boat Operators Association participated in the rally and demanded that the State Government should curb illegal fishing by foreign trawlers, industrial aquaculture in the coastal zone should be stopped and it should be ensured there would be remunerative prices for sea produce. The fishermen demanded the laying of proper roads to fishing villages, creation of health, educational, housing, drinking water and information facilities at their villages. They wanted identity cards for genuine fisherfolk should be issued and fisheries complexes in every district should be set up by the government.

It was demanded that government may strictly implement the Marine Fishing Regulation Act. A direction may also be given to fishery officials to ensure compulsory insurance for each and every crew members of non-mechanised boats and trawlers. If was also urged that extension of old age pension for fish workers, setting up of Matsyasala Mandals at district and State-levels, special scholarships for students from the community, sanctioning of widow pension to wives of fishermen who lost lives while at sea and special quota for admission of their children in ashram schools. It was appealed that steps to remove basic causes that resulted in a large number of fisher-folk migrating to other States to eke out a livelihood should be taken.

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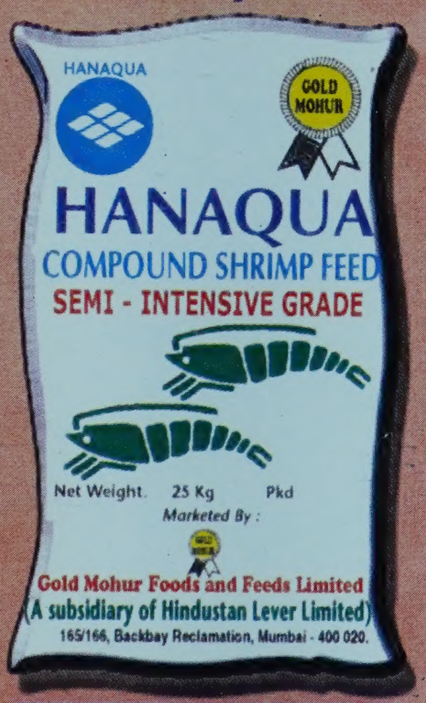

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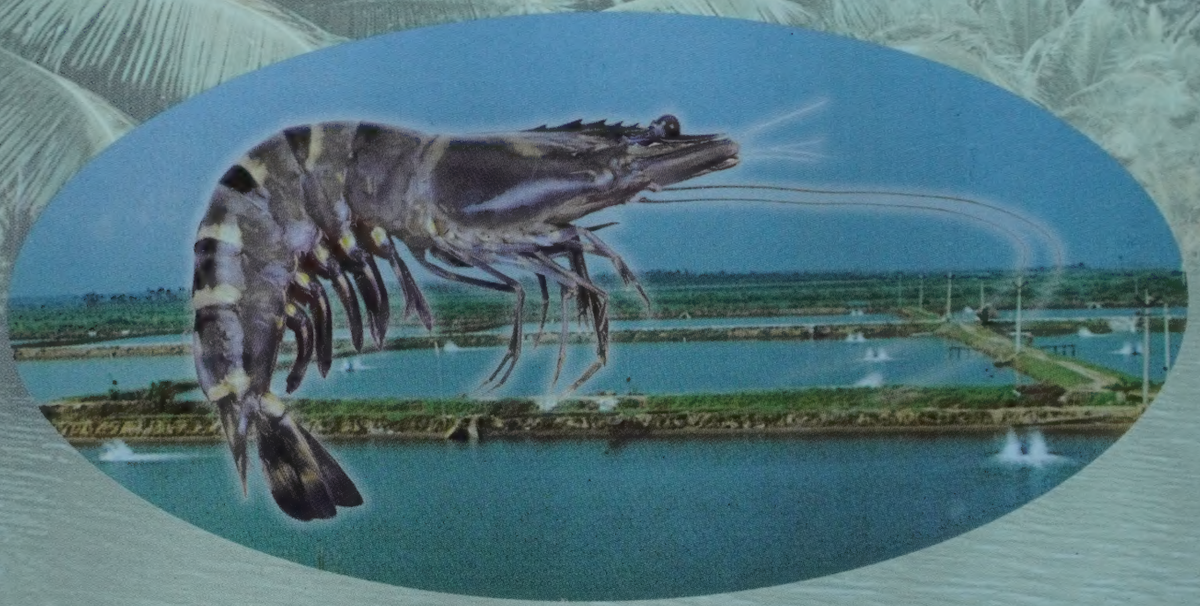

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